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MINISTRY OF FORESTS

# Boundary Timber Supply Area

## Rationale for Allowable Annual Cut (AAC) Determination

**Effective January 1, 2002**

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**Chief Forester**

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## Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Boundary Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

## Description of the TSA

The Boundary TSA covers approximately 579 000 hectares in south central British Columbia at the western edge of the British Columbia Forest Service (BCFS) Nelson Forest Region. The TSA is bounded by the Okanagan Highland Range of the Monashee Mountains to the west, the Christina Range to the east, and the Canada-U.S. border to the south. The TSA encompasses most of the Kettle and Granby River drainages.

The Boundary TSA is characterized by mountainous topography in the east and rolling terrain with flat valley bottoms in the west. The varied topography and climatic conditions in the TSA contribute to diverse forests. The primary tree species is lodgepole pine, but forests are also comprised of Douglas-fir, larch, spruce and subalpine fir. Species occurring in smaller amounts include western redcedar, western hemlock, white pine, ponderosa pine, aspen, and birch.

Of the total TSA, approximately 359 314 hectares are classified as Crown-owned productive forest that is managed by the BCFS. About 134 408 hectares are not managed directly by the BCFS including parks, protected areas, and federal and private land.

The forests of the Boundary TSA provide a wide range of forest land resources, including forest products, minerals, forage, fish and wildlife habitat, and recreation and tourism opportunities. Extensive rangeland areas provide forest vegetation for both livestock and wildlife. Recreational use of the forests in the Boundary TSA is high due to the proximity of several provincial parks, including Granby, Gladstone, and Conkle Lake, as well as numerous smaller parks, recreation sites and trails.

The Boundary TSA includes the city of Grand Forks and several small communities including Christina Lake, Greenwood, Midway, Rock Creek, Bridesville and Beaverdell. The total population of the TSA is about 12,400 individuals (1996 Census).

## History of the AAC

In 1982, the allowable annual cut (AAC) for the Boundary TSA was set at 700 000 cubic metres. From 1993 to 1995, the AAC was temporarily increased to 900 000 cubic metres to allow for the harvest of mountain pine beetle infested stands.

Effective March 1, 1996, the AAC was set at 700 000 cubic metres. The AAC is currently apportioned by the Minister of Forests as follows:

| Apportionment | AAC ($m^3/yr$) | % of total AAC |
|---|---|---|
| Forest licence, replaceable | 502 493 | 71.8 |
| Timber sale licences, < 10 000 $m^{3/yr}$ | 14 279 | 2.0 |
| Small Business Forest Enterprise Program – all categories | 162 428 | 23.2 |
| Forest Service Reserve | 2 500 | 0.4 |
| Woodlot licences | 18 300 | 2.6 |
| **Total** | **700 000** | **100.0** |

## New AAC determination

Effective January 1, 2002, the new AAC for the Boundary TSA will be 700 000 cubic metres. This determination excludes new woodlots issued since the 1996 determination.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

## Information sources used in the AAC determination

- *Boundary Timber Supply Area (TSA) Data Package and Information Report*, BCFS, September 1999.
- *Boundary TSA Analysis Report and Public Discussion Paper*, BCFS, November 2000.
- *Boundary TSA Summary of Public Input on Data Package and TSA Analysis Report*, BCFS, March 2000 (draft).
- *Boundary Timber Supply Analysis*, BCFS, November 1994.
- *Boundary TSA Rationale for AAC determination*, BCFS, March 1996.
- *Kootenay Boundary Land Use Plan (KBLUP)*, Government of BC, *1995*
- *Kootenay/Boundary Land Use Plan Implementation Strategy*, Kootenay Inter-Agency Management Committee, June 1997.
- *Kootenay-Boundary Higher Level Plan Order, Final*, December 2000.
- *Forest Practices Code of British Columbia Act*, July 1995.
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, April 1995.

- *Forest Practices Code of British Columbia Guidebooks*, BCFS and Ministry of Environment, Lands and Parks (MELP).
- *Forest Practices Code Timber Supply Analysis*, BCFS and MELP, February 1996.
- *Supplemental Guidelines for Forest Development Plans*, Boundary Forest District, April 2001.
- *Working Paper 36/1998, Site Index Adjustments for Old-Growth Stands Based on Veteran Trees,* Nigh, G.D., BCFS Research Branch, 1998.
- *Working Paper 37/1998, Site Index Adjustments for Old-Growth Stands Based on Paired Plots*, Nussbaum, A.F., BCFS Research Branch, 1998.
- *Boundary Forest District, Dense Pine Management Inventory, Management Strategy,* Strathinness Forestry Consultants (Nelson) Ltd., March 1999.
- *Statistical Adjustment of Dense Lodgepole Pine Polygons in the Boundary Forest District,* Version 2, J.S. Thrower and Associates Ltd., June 1999.
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province.
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources.
- Letter from the deputy ministers of Forests and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives for achieving acceptable impacts on timber supply from biodiversity management.
- Technical review and evaluation of current operating conditions through comprehensive discussions with staff of the MOF and MELP, including the AAC determination meeting held in Grand Forks, March 28 and 29, 2001.

**Role and limitations of the technical information used**

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as existing timber volumes, the rate of timber growth, and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. Many of the factors used as inputs to timber supply analysis are uncertain due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics helps to reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the relevant social, cultural and economic factors when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for the Boundary TSA, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

### Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for TSAs and tree farm licences (TFLs). Section 8 is reproduced in full as Appendix 1.

### Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires consistency when addressing these changes and associated uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it is necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated

in current planning guidelines or the *Forest Practices Code of British Columbia Act* and its associated regulations (the Forest Practices Code).

The *Forest Practices Code of British Columbia Regulations* were originally approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Forest Practices Code has been fully implemented since the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

The eventual timber supply impacts associated with strategic land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy, and Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government. Thus I do not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order-in-council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

In the Boundary TSA, government's approval of the Kootenay-Boundary Land Use Plan (KBLUP) in 1995, and decisions on protected areas have clarified many aspects of land and resource use and management. The Kootenay-Boundary Higher Level Plan (KB HLP) Order was designated by Cabinet on December 22, 2000. The implementation of this higher level plan order will provide further certainty regarding resource management in the area.

Forest Renewal British Columbia has funded a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long-term. As with all components of my determinations, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are improvements from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent court decisions including those in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting those obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Boundary TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

With respect to future treaty decisions, as with other land-use decisions it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government. I am aware the Okanagan Nation Alliance has identified the entire TSA as their traditional territory. The Shuswap First Nation have identified the northern part of the TSA as their traditional territory. The Westbank First Nation treaty claim interest area is also located in the northern part of the TSA. As any decisions on treaty negotiations pertinent to the Boundary TSA are undertaken by government, they will be reflected in future AAC determinations for the TSA.

Overall, in making AAC determinations, I am mindful of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act* and the *Forest Act*.

## The role of the timber supply analysis

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the timber supply review program.

For each AAC determination for a TSA, a timber supply analysis is carried out by BCFS staff using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model (Forest Stand Simulator, or FSSIM), a series of timber supply forecasts is produced reflecting different starting harvest levels, rates of change over time, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. Often termed the 'base case', this serves as a reference forecast, and forms the basis for comparison when assessing the implications of uncertainty for timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the referenced forecast for a TSA is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the reference forecast are realistic and current, and the degree to which the resulting predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgement, using current available information about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the reference forecast. Judgements that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Timber supply analysis for the Boundary TSA

The *November 2000 Timber Supply Review Boundary Timber Supply Area Analysis Report* provided two main alternative projections for my consideration as possible reference forecasts based on differing assumptions about initial harvest levels and flow. The first forecast, called the 'current AAC harvest forecast', shows that the current AAC of 700 000 cubic metres per year could be maintained for 100 years, and thereafter a steady long-term harvest level of 749 000 cubic metres per year is achieved. The second forecast, called the 'maximum even-flow forecast', shows an initial harvest level of 749 000 cubic metres per year for the entire planning horizon. The second forecast indicates a very stable timber supply and suggests that a higher harvest level is possible. For the purpose of sensitivity analyses, which assess the implications of uncertainty, the maximum even-flow was used as the reference forecast as little sensitivity could be shown for the first forecast.

For convenience in this document, from this point onward I have referred to the reference forecast as the 'maximum even-flow forecast'.

Both forecasts incorporate several changes from the 1994 analysis, such as:

- implementation of the Forest Practices Code, including riparian and biodiversity requirements for forest retention.
- government's approval of the Kootenay-Boundary Land Use Plan, which established the Granby Provincial Park and Gladstone Provincial Park.

A more detailed explanation of the changes can be found in the November 2000 analysis report.

Public input from the Granby Wilderness Society and Friends of the Granby Wilderness Society expressed concern that there was a visible bias to minimize the factors that had downward pressures on timber supply. They submit that this is evident when comparing assumptions made in the Boundary's data package to other data packages in the Nelson Forest Region, and in comparison with the assumptions used in TSR I for the Boundary TSA. I have carefully reviewed the assumptions in detail and have revised some where appropriate.

In this rationale, I will discuss many of those analysis assumptions in the context of my considerations for this AAC determination. However, where my review of an assumption has concluded that I am satisfied it was appropriately modelled in the timber supply analysis, then I will not discuss my considerations in detail in this document, other than to note my agreement with the approach taken in the analysis. Nonetheless, some factors for which the assumptions were appropriately modelled in the analysis may warrant discussion for other reasons, such as public input, lack of clarity in the analysis report, or concerns resulting from the previous determination for the Boundary TSA. As a result, I have provided my consideration of such factors in this rationale.

As discussed in the following considerations and with the qualifications there expressed, I am satisfied that the maximum even-flow forecast provides a suitable point of reference for my assessment of the timber supply for this AAC determination.

## Consideration of Factors as Required by Section 8 of the *Forest Act*

**Section 8 (8)**

**In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider**

**(a) the rate of timber production that may be sustained on the area, taking into account**

**(i) the composition of the forest and its expected rate of growth on the area,**

Land base contributing to timber harvesting

*- general comments*

As part of the process used to define the timber harvesting land base in the timber supply analysis, a series of deductions are made from the productive forest land base. These deductions account for the factors that effectively reduce the suitability or availability of the productive forest area for harvest, for ecological, economic or social reasons. The deducted areas are detailed in the aforementioned analysis report, and summarized in Table 2 of the report. In the Boundary TSA, the deductions result in a timber harvesting land base of 288 247 hectares, or approximately 62 percent of the Crown productive forest land.

I have considered all of the deductions applied in the derivation of the timber harvesting land base for the Boundary TSA.

Factors associated with deriving the timber harvesting land base for which, based on my thorough review, I accept the assumptions applied in the analysis I have not discussed further in this rationale. These factors include deciduous forest types, low productivity sites, archaeological sites and protected areas.

Where my consideration of the information has identified a factor which in my estimation requires discussion in this document, it is described below.

*- physical and economic operability*

Those portions of the TSA which are neither physically operable nor economically feasible to harvest are categorized as inoperable, and are excluded when deriving the timber harvesting land base. In 1991, BCFS staff completed operability mapping for the Boundary TSA, which studied and categorized operable areas. In 1993, Pope & Talbot Ltd. (a licensee in the TSA) undertook an additional operability study. A review by BCFS in 1994 found the differences between the two studies to be minimal.

In a submission from the Granby Wilderness Society, they stated that the comprehensive 1991 study of operability seems reasonable. As well, the district staff indicated that the 1991 operability study is still current and reflective of operability in the TSA.

In the analysis, 22 118 hectares were deducted as inoperable based on the operability mapping, which represents approximately 6 percent of the Crown productive forest.

Advice from the Ministry of Environment, Lands and Parks staff (now with either the Ministry of Water, Lands, and Air Protection or the Ministry of Sustainable Resource Management) and submissions from the public expressed concerns that harvesting is not occurring across the profile of different terrain types, notably the more difficult terrain. District staff examined the harvest profile by slope class for the TSA and observed that harvesting is occurring at a reasonable level in all slope classes within the timber harvesting land base.

District staff also advised me that forest development plans have included proposed harvest areas that are outside of the mapped operability line.

I have considered the concerns raised about the avoidance of harvesting in the more difficult terrain types. Actual harvesting is reasonably well-distributed across terrain types and there is no evidence of avoidance of the more difficult terrain. Operability has been reviewed twice, and in both instances the operability line has been confirmed. I note that the task of defining operability is often very challenging in complex terrain. I encourage ongoing study of operability mapping and of harvesting in difficult terrain for the next determination. For this determination, I find the assumptions for operability reasonable and I have made no adjustments.

- *environmentally sensitive areas*

An environmentally sensitive area (ESA) is an area identified in the forest inventory as sensitive to disturbance (such as unstable terrain, or areas that are difficult to reforest) and/or significantly valuable for fisheries, wildlife, water or recreation resources. Areas can be identified as either very sensitive (E'1s) or moderately sensitive (E'2s) to disturbance, and are either entirely or partially removed from the timber harvesting land base.

In deriving the timber harvesting land base for the Boundary TSA, 26 438 hectares or 7.4 percent of the productive forest were deducted for ESAs. These deductions were comprised of all areas classified as having highly unstable soils (Es1), or severe regeneration problems caused by biotic factors (Ep1), and half of the moderately sensitive soils (Es2) within community watersheds. There were no ESA deductions for recreation, wildlife, moderate soil sensitivity (Es2), and moderate regeneration sensitivity (Ep2) as the majority of these areas were found to overlap with areas already deducted from the timber harvesting land base for other reasons. For Es2s that remain in the timber harvesting land base, operational practices indicate that harvesting is generally not constrained in these areas and hence they were not deducted.

District staff note that a review of harvesting over the past ten years indicates that there has been a small amount of harvesting in Es1s and Ep1s.

In a joint submission from the Granby Wilderness Society and Friends of the Granby Environmental Society, they question why terrain stability mapping was not incorporated in the analysis. They state this type of mapping was used in most other TSAs and is more reliable than using environmentally sensitive areas for fragile or unstable soils. They also state that areas with significantly fragile or unstable soils (Es2) within high-value fish stream watersheds and other domestic watersheds should be treated as they are in community

watersheds (i.e., a 50 percent area reduction). District staff advised me that terrain stability mapping has recently been completed for the TSA, however an assessment of the mapping to determine how much area should be excluded from the timber harvesting land base has not been undertaken.

Before the next determination, I request that the district staff review ESAs where there has been some timber harvesting and refine the ESA reductions where appropriate. I also request that staff examine the terrain stability mapping to assess the ESAs soils classification and to ensure that it is used in the next analysis to the maximum extent possible, particularly if it is assessed as representing an improvement in soils stability projections over the ESA information. For this determination, I have reviewed the methodology used to account for environmentally sensitive areas and have made no adjustments.

*- problem forest types*

Stands that are physically operable and exceed low site criteria but are not currently utilized because of low timber quality or volume are referred to as problem forest types. This definition is based on economic criteria for the purpose of defining the timber harvesting land base, and does not imply these types are not important in terms of their role and function in the ecosystem. For the Boundary TSA, problem forest types include dense stands of lodgepole pine that meet criteria as defined by age, height, stocking class and site index. No other problem forest types are identified for the TSA.

In the previous determination, I asked staff to develop a management strategy for dense pine stands including an examination of merchantability, appropriate utilization standards, and appropriate minimum harvestable ages, leading to clarification of the areas which should be included in the timber harvesting land base.

In 1999, a field study was completed which provided estimates of the area, volume and location of dense pine stands. Approximately 39 000 hectares were identified as having dense pine attributes. Of this, approximately 6182 hectares were identified as unmerchantable and subsequently subtracted from the timber harvesting land base. The remaining 32 818 hectares were defined as merchantable and included in the timber harvesting land base.

The field study also provided information about ages, height and site productivity for the dense pine stands. Based on this information, volumes and site index values were recalculated using statistical adjustment factors derived from the field data. As a result of these adjustments, volumes for dense pine stands were reduced by about 8 percent. The outcome of age and height adjustments increased the average site index values for pure and leading pine stands on good and medium sites—before adjustment the values ranged from 16.3 to 19.7 metres and after adjustment from 16.5 to 20.4 metres. Average site index values decreased for pure pine stands on poor sites—from 12.3 metres before adjustment to 11.3 metres after adjustment. Average site index values also decreased for leading pine stands on poor sites—from 11.6 metres before adjustment to 11.4 metres after adjustment.

In summary, the recent examination of dense pine stands has improved the district's assessment of them, both in terms of merchantability and productivity. I appreciate the district's study of this factor and find that the methodology applied to account for dense pine stands is reasonable for this determination.

*- roads, trails and landings*

In the analysis, a percentage of the productive forested area was excluded to account for the permanent loss of productive land to roads, trails, landings and infrastructure right-of-ways (powerlines, and pipelines). Separate estimates were made for existing and future road structures, to reflect both changes in road building practices and road network requirements over time. Estimates account for the area that is permanently removed from the timber harvesting land base.

*- existing roads, trails and landings*

To account for existing secondary roads, logging roads, trails, powerlines and pipelines, the length of each feature was estimated and multiplied by a right-of-way width, which ranged from 3 metres to 30 metres depending on road type. To account for existing landings, the estimated number of landings per hectare was multiplied by an average landing area. These calculations were based on field measurements of road widths, a review of forest cover maps and silviculture information, and information from licensees on road building over the last ten years. In the timber supply analysis, the total area removed from the timber harvesting land base for these existing features was 4867 hectares.

Subsequent to the analysis, district staff reviewed the logging road width criteria and based on additional field measurements across a variety of terrain classes and slopes they categorized roads into two types of logging roads—Forest Service roads and spur roads. As a result, road widths for Forest Service roads were estimated to be an average of 14 metres, and spur roads (i.e., those usually under road permit) were estimated to be an average of 8.5 metres wide. No changes were determined for other existing features, such as landings. Based on the revised road width estimates, district staff confirmed that an additional 782 hectares should be deducted from the timber harvesting land base to account for existing roads.

Sensitivity analysis examined the impact of overestimating the timber harvesting land base. If the timber harvesting land base has been overestimated by 10 percent (28 824 hectares), the initial harvest level can be maintained for four decades and then it declines by 10 percent to a lower long-term harvest level of 668 000 cubic metres per year. As this sensitivity analysis examines a much larger uncertainty, it illustrates that in the short term, the timber supply forecast will not be sensitive to the recommended change to account for existing roads.

Public input from the Granby Wilderness Society, Friends of the Granby Environmental Society, and input from MELP staff expressed concern that the right-of-way widths used in the analysis are too narrow to adequately account for the loss of productive area due to roads. Following public release of the data package, district staff reviewed the road widths and as noted above, two types of logging roads were defined and their road widths were revised. District staff advise me that the full road width is accounted for in the calculations,

and that the productive area along the roads will, in most cases, fall under a silviculture prescription and will be reforested. Silviculture surveys are carried out on these areas and their productivity is captured in the inventory update process. Some areas within right-of-ways are kept clear for safety concerns, but this is an infrequent occurrence.

Additional input from the Granby Wilderness Society and the Friends of the Granby Environmental Society states that regardless of the requirement to rehabilitate skid trails, some degree of detrimental soil disturbance will occur. They say assuming no disturbance is not realistic and suggest another 2 to 3 percent netdown to account for productivity lost to trails. District staff noted that soil disturbance and site degradation survey results indicate in general that the limits set in the silviculture prescriptions have not been exceeded. Any areas where the limits have been exceeded are documented in a silviculture prescription amendment or rehabilitated.

Pope & Talbot's submission says allowances for roads and trails appear reasonable, but deductions for landings are high based on their experience. District staff reviewed a sample of licensee silviculture prescriptions to determine the average landing size and believe that allowances reflect current practices.

I am mindful of the concerns raised regarding the assumptions made about estimating the area of existing roads, trails and landings. Until more detailed information suggests otherwise, I will accept the district's refined criteria which results in an additional reduction of 782 hectares to account for existing roads, trails and lands. Sensitivity analysis showed that the timber supply is not sensitive to a small underestimation of the timber harvesting land base, particularly in the short term. For this determination I have accounted for an additional 782 hectares for existing roads, trails and landings, as discussed further under 'Reasons for decision'.

*- future roads, trails and landings*

To account for future roads, trails and landings, BCFS staff used the following assumptions: 6 percent of the area inside cutblocks would be used for future roads, trails and landings; stands less than 20 years old were considered currently roaded; and the need for current levels of road building would continue until the second pass of timber harvesting occurs, assumed to start in about 59 years. These assumptions were based on approximate road building measures carried out by licensees and the BC Forest Service. From these assumptions, the total area for future roads, trails and landings was estimated to be 14 568 hectares.

However, following the release of the analysis report, BCFS staff in consultation with licensees, revised the assumptions for future roads as the deductions seemed high given that the TSA is already extensively roaded. Using the revised assumptions, district staff re-calculated the area for future roads, trails, and landings in two steps as follows. The estimated length of new Forest Service and spur roads was multiplied by the revised road widths — as documented in the previous section, and an estimated area for landings was added. In the second step, this amount (in units of hectares per year) was then assumed to decline until the second-pass of timber harvesting, assumed to be 59 years. Using these revised assumptions, the estimate of future roads, trails and lands was reduced from

14 568 hectares to 2875 hectares. This revision potentially represented a 4-percent underestimation of the size of the future timber harvesting land base. District staff confirm that the TSA is fairly well accessed and believe that the rate of decline is a reasonable interpretation of future road building needs.

Pope & Talbot's submission states agreement that future road allowances will start declining as the TSA is accessed and that this pattern must be accurately reflected and described in the analysis.

I have reviewed the district's recommendations regarding revised road widths and the area estimated for future roads, trails, and landings. In order to better assess these proposed revisions, I asked BCFS staff to review the methodology for estimating future roads, trails and landings. The review findings were summarized for my consideration based on an examination of the original and revised estimates for future roads, trails and landings, and the rate of decline for future road construction in the TSA.

The review found that the revised road widths seemed to be slightly low by up to 1.0 to 1.5 metres, and the rate of decline of future road construction appeared to be overestimated when compared with historical information and projections used elsewhere in the province. The review concludes that the area estimated for future roads, trails and landings is likely larger than the revised estimate but not as large as originally assumed in the timber supply analysis. However, given that too much area may have been deducted for future road construction resulting in an underestimation of the future timber harvesting land base, there is no downward impact on the short-term timber supply, which addresses the initial concerns that were expressed.

From the foregoing information it is evident there is some uncertainty about the amount of area likely to be developed for future roads. In consideration of the review and the district's confirmation that the TSA is already well accessed, I find the district's conclusion of an overestimation of future roads—as reported in the analysis—to be reasonable. However, while the estimates may not be as high as 14 568 hectares, they are not likely as low as 2875 hectares. Therefore, I have considered the future timber harvesting land base to be underestimated by less than the 4 percent suggested by district staff. I have accounted for this upward pressure as discussed below, under 'Reasons for decision'. I encourage the district staff to review other methodologies applied in TSR for estimating future roads, trails and landings for the next determination.

- *woodlot licences*

The *Forest Act* requires AACs determined for TSAs to exclude woodlot licence areas. Therefore in the analysis, 15 828 hectares classified as woodlot licences were deducted from the productive land base. However, since the time of the analysis, an additional 2581 hectares of Crown land have been assigned to woodlot licences. In my determination, as noted in 'Reasons for decision', I have accounted for the deduction of 2581 hectares from the timber harvesting land base.

Existing forest inventory

The inventory data used for the timber supply analysis is based on a forest inventory completed in 1989. For the analysis, the inventory file was updated to July 1996 to account for changes in ownership, growth, and denudation through harvesting or fire.

To address uncertainties raised in the last AAC determination, I directed BCFS staff to complete an inventory audit of the Boundary TSA to discern if discrepancies could be found in the volume estimates for existing stands. In 1998, an inventory audit was completed on the mature, immature and non-forest components for the Boundary TSA. As reported in the *Boundary TSA Inventory Audit* report (1998) the audit found no significant problems for mature stand volumes. Subsequent analysis of stratified data showed similar levels of acceptability for volume estimates in the operable forest areas. Audit results for the immature component suggested that the immature site index assignment may not be accurate and recommended further review of this issue. Finally, the audit assessment of the non-forest classification in the TSA indicated that it did not meet provincial standards, largely due to changes to the classification standards for certain types of non-forest areas. The non-forest component includes areas such as lakes, gravel pits and alpine meadows, and as such has very little impact on the forested area considered available for timber harvesting as reported in the timber supply analysis.

In consideration of the information presented and the concerns raised, I am satisfied that the existing inventory represents the best available information regarding current forest inventory.

Other factors associated with the existing forest inventory for which, based on my thorough review, I accept the assumptions as modelled in the analysis are not discussed below. These factors include age class composition and species profile.

- *volume estimates for existing stands*

The Variable Density Yield Prediction (VDYP) model version 6.5a, developed and supported by the Ministry of Forests' Resources Inventory Branch, was used to estimate timber volumes for existing natural stands older than 20 years.

As discussed under *problem forest types*, volume estimates for dense pine stands were reduced about 8 percent. However, even after accounting for volume reductions for wildlife trees and wildlife tree patches, the total volume estimates for all existing stands were still 3.9 percent higher on average than the previous determination. This is largely due to higher volume estimates for Douglas fir-leading stands, based on updated inventory information.

Public input from the Granby Wilderness Society suggested there should be a series of analysis units that identify forest types that were previously partially cut. District staff noted that partially harvested areas cover approximately 9 percent of the total area harvested in the TSA. Partial harvesting usually removes about 30 percent of the stand volume. Separate analysis units were not modelled in the analysis as the district believed that since the last reinventory in 1989, partially harvested stands were accounted for in the forest inventory by a 30-percent reduction in crown closure. However, a review of these stands by regional staff showed that on

average, VDYP overestimates the volume for residual stands (covering 1 percent of the mature forested land base) by about 10 percent, resulting in an overestimation of about 0.1 percent of the total volume attributable to the timber harvesting land base.

For this determination, I have accounted for a small overestimation of volume in stands partially harvested. Apart from this, as indicated from the *1998 Boundary TSA Inventory Audit*, no significant problems were found in the estimates of existing stand volumes. I am satisfied that the methodology used to determine existing stand volumes is reasonable, and I accounted for the small overestimation of up to 0.1 percent as discussed below, under 'Reasons for decision'.

Expected rate of growth

I have considered the information regarding the various operational adjustment factors applied to volume estimates for regenerating stands. These factors account for reduced productivity due to incomplete site occupancy and unproductive areas, and decay, waste and breakage. I am satisfied that the analysis assumptions were appropriate in this regard, and I will not discuss my considerations of these factors in detail in this rationale.

*- site productivity estimates*

Inventory data includes estimates of site productivity for each forest stand. Site productivity is expressed in terms of a site index, which is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow, which in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the age at which a stand will reach a merchantable size.

In general, in British Columbia, site indices determined from younger stands (i.e., less than 31 years old), and older stands (i.e., over 150 years old) may not accurately reflect potential site productivity. In younger stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In older stands, which have not been subject to management of stocking density, the trees measured to estimate site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where studies—such as the Old-Growth Site Index (OGSI) 'paired plot' project and the 'veteran' study—as well as results from Site Index/BEC site series correlation, suggest that actual site indices may be higher than those indicated by existing data from older stands. Such studies indicate that site productivity has generally been underestimated and therefore future managed stands tend to grow faster than projected by inventory-based site index estimates derived from older forests.

In the timber supply analysis, site productivity was rated as good, medium, poor, or low based on the site index values (expressed as height in metres at age 50) from the forest inventory file. Good sites were defined as having a site index value of 18.0 or greater, medium sites a value between 13.0 and 17.9, and poor sites a value of less than 13.0, depending on the tree species dominating the site. Sites of very low productivity were defined as having site index values less than 8.0 and were excluded from the timber harvesting land base.

Sensitivity analysis examined the impact to timber supply if site productivity is underestimated to the extent suggested by the OGSI studies. For the sensitivity analysis, the site indices of all stands older than 140 years of age, occupying about 14.6 percent of the timber harvesting land base, were adjusted based on results of the provincial studies. For Douglas-fir, lodgepole pine and interior spruce, adjustments were based on the paired plot results; for all other species, adjustments were based on the veteran tree study. Timber supply analysis inputs affected by changes in future productivity—including minimum harvestable ages, green-up ages, and managed stand volume estimates—were also recalculated based on the adjusted average site productivity. The sensitivity analysis results indicated that beginning in decade six, the mid- and long-term timber supply could be as much as 5.7 percent greater than the maximum even-flow forecast.

Public input from Pope & Talbot Ltd. questioned why the OGSI adjustments were not included in the base case. The Granby Wilderness Society agreed with treating the results of the OGSI study as unproven theory. District staff confirmed that although the results of the sensitivity analysis indicate that long-term timber supply could be higher than currently estimated, site index adjustments were not included in the maximum even-flow forecast, except for dense pine stands, as there is neither local data available nor long-term monitoring studies of regenerated stands in place to support additional adjustments.

The Granby Wilderness Society expressed concern regarding mis-typing of some high elevation sites that have low-growing potential, but are not typed as such. Staff believe that most of these areas would likely be excluded as part of the low-productivity deduction.

Input from the general public also suggested that the discussion about the likely overestimation of site index in dense lodgepole pine stands probably also applies to pine stands severely infected with dwarf mistletoe which are particularly common in the north west part of the district. The input also questioned if there are not useful correlations between ecosystem types and site indices that could be used instead of tree measurement in old, diseased and dense stands. District staff confirmed that dwarf mistletoe is not a major forest health concern within the TSA. Site index/ecosystem correlation is one method that could be used to determine site index; the appropriate method depends on stand conditions and the accuracy required. District staff confirm that as improved inventory and site productivity information becomes available it is incorporated into the inventory files through the update process.

While I acknowledge that there is uncertainty related to the actual performance of stands relative to their potential, the OGSI study results clearly demonstrate that some stands are growing at a faster rate than would be expected based on measurements from older forests. Although the magnitude of the productivity underestimation is not certain, the results of the sensitivity analysis show that future timber supply projections could be higher.

Based on research data and my knowledge of site productivity in BC, I have considered the implications of this underestimation, and acknowledge that the timber supply in the mid to long term could be greater than projected in the maximum even-flow forecast. I will discuss my considerations of this further under 'Reasons for decision'. Before the next determination, I strongly encourage a local review of site productivity to determine the magnitude of any site productivity adjustments that might be appropriate for the Boundary TSA.

*- volume estimates for regenerating stands*

For the Boundary TSA timber supply analysis, the Table Interpolation Program for Stand Yields (TIPSY) was used to estimate the growth and yield of existing stands less than 21 years old, and of all future regenerated stands.

The Granby Wilderness Society submits that TIPSY growth rates are unsubstantiated for this area and are overly optimistic. They also submit that VDYP curves should be used in second-growth stands until experience can confirm TIPSY projections, that minimum harvestable ages and green-up times should be adjusted upward accordingly, and that climate change may make even VDYP curves unrealistic. I note that there is continual work by BCFS research staff to improve TIPSY. There is currently a large of amount of data by species, by biogeoclimatic ecosystem classification (BEC), and by site productivity class to support TIPSY. There is also ongoing work on other models such as Prognosis, used for modelling complex stands. I also note that research into climate change is in progress and I look forward to information developments to help guide future timber supply projections and management strategies.

Two public submissions question the growth rates expected for managed stands and state that tree plantations across the province are not performing as expected. The submissions note problems with forest health, wood quality and strength, and state that if increased yields should occur they should accrue to future generations and not be counted as current gains. As discussed above in *site productivity estimates*, results of provincial OGSI studies and SIBEC studies have indicated that site productivity estimates for managed stands have generally been underestimated; these stands are actually growing faster than projected by inventory-based site index estimates from old-growth stands.

In consideration of the information presented and the concerns raised, I am satisfied that the assumptions appropriately accounted for the volume estimates for regenerating stands in the TSA, and I make no adjustments for this determination.

*- use of select seed*

The Forest Practices Code requires the use of improved (class A) seed from seed orchards for regeneration where available. Class A seed is the product of the tree improvement program, which uses standard domestication/breeding techniques to select naturally occurring well-performing trees. Select natural seeds from seed orchards produces trees that grow faster than seeds from non-selected natural trees for a specific time, which varies by species and site. As a result, a stand composed of trees grown from select seed has a greater volume at the same age than those grown from non-selected seed, given the same species composition. Current expectations are that the volume differences will begin to decrease beyond a certain stand age.

Subsequent to the preparation of the data package for the timber supply analysis, information became available about yield gains associated with planting improved stock in the Boundary TSA. Currently 35 percent of seedlings are planted with class A seed and volume gains are estimated to be 1.6 percent when stands reach 60 to 80 years. By 2006 district staff expect that 60 percent of seedlings planted will be from class A seed, resulting in an estimated volume gain of 2.7 percent when stands reach 60 to 80 years.

Input from Pope & Talbot Ltd. offered that genetic improvement programs are expected to result in significant yield improvements and these should be reflected in the analysis.

I have considered the information regarding the assumptions for estimating volumes of regenerated stands and the use of select seed in the Boundary TSA. I have accounted for the timber supply implications from the current use of select seed, which represents an upward pressure of up to 1.6 percent, which mostly affects the timber supply in the mid- to long term as discussed further, under 'Reasons for decision.' If the use of class A seed continues to increase as suggested, then further yield gains are likely and can be taken into account in future timber supply analyses.

*- minimum harvestable ages*

A minimum harvestable age is an estimate of the earliest age at which a forest stand is projected to meet minimum merchantability criteria. In practice, many forest stands are harvested beyond the minimum harvestable age due to constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

In the analysis for the Boundary TSA, the minimum harvestable ages ranged from 60 to 130 years. For pure pine and pine-leading analysis units, ages were based on a minimum volume per hectare and a minimum average diameter at breast height (DBH). For all other analysis units, ages were based on a minimum volume per hectare and minimum average DBH plus the achievement of 95 percent culmination mean annual increment (CMAI). In a few cases, where the estimated ages seemed to too high or too low, they were adjusted by BCFS district staff using professional judgement.

I observe that minimum harvestable ages seem to vary significantly across the interior of the province. District staff advised me that the criteria used for minimum harvestable ages are reflective of current and projected future harvesting practices in the TSA. District staff compared the ages to the values applied in the previous determination, and also reviewed them with district licensees. No concerns were noted from this review.

Sensitivity analysis was used to assess the timber supply implications of increasing or decreasing minimum harvestable ages. The results indicate that if the minimum harvestable ages were increased by 20 years or if minimum harvestable ages were set at culmination age, the timber supply would decline by 5.7 percent until about decade 11, then increase to the same long-term harvest level as the maximum even-flow forecast. If the minimum harvestable ages were decreased by 20 years, there would be no effect on the timber supply based on the maximum even-flow forecast.

The Granby Wilderness Society submitted that the minimum harvestable age should be culmination age. District staff indicated that harvesting is not currently or expected in the future to be delayed until culmination age.

Determining the precise bounds for minimum harvestable ages is difficult as it is hard to determine future harvesting criteria. Staff confirm that the criteria for minimum harvestable ages are a reasonable approximation of future projections for this TSA. I encourage staff to continue to refine and improve assumptions for minimum harvestable ages over time. In summary I do not believe there is a risk to timber supply from accepting the minimum

harvestable ages as assumed in the analysis for this determination, and I have made no adjustments.

**(ii) the expected time that it will take the forest to become re-established on the area following denudation,**

Expected time for forests to be re-established following harvest

I have reviewed all the information, including public input, regarding regeneration delay, impediments to prompt regeneration and not-satisfactorily-restocked areas, and I am satisfied that the assumptions in the analysis for these factors were appropriate. As a result, I will not discuss my considerations of these factors in this rationale.

**(iii) silvicultural treatments to be applied to the area:**

Silvicultural systems

The main silvicultural system, representing over half of the systems used in harvesting in the Boundary TSA, is clearcutting. Other systems in the TSA include selection, shelterwood, seedtree, intermediate cuts and patch cuts. Clearcutting, shelterwood and seed-tree systems are examples of even-age management which establishes trees at approximately the same time, and manages existing stands of trees so that most of the trees in a stand are approximately the same size and age. Selection, intermediate cut and patch cut systems, in general, are characterized by removal of a portion of the stand with re-entry at a later date creating an uneven-aged stand structure

Public input on the data package from Pope & Talbot Ltd. and from individuals questioned how partial cutting and uneven-aged management would be modelled in the analysis. One submission requested that ecosystem-based, alternative systems be modelled in the base case, not as an alternative but as a replacement to clearcutting.

In the timber supply analysis for the Boundary TSA, only clearcut harvesting was modelled. District staff felt that this was appropriate since they assumed that partial harvesting was accounted for in the forest inventory, as discussed earlier under – *volume estimates for existing stands.* Also, modelling tools that accurately reflect partial harvesting are not currently available. I note that work is underway to develop and refine modelling tools, such as Prognosis, for modelling uneven-aged and complex stands. I look forward to these new approaches being applied in future analyses.

Although there was no sensitivity analysis done to model alternative silviculture systems, BCFS district staff do not expect any impact to harvest levels over time due to the stability of the timber supply and the eventual harvesting of residual volumes in areas harvested using non-clearcutting systems.

I acknowledge that silviculture systems are somewhat different on the ground than were modelled in the analysis. However, there is no clear evidence to suggest that this poses a risk to the short-term timber supply, and I have made no further adjustments for this factor in the determination.

Incremental silviculture

In general, incremental silviculture includes activities beyond those required to establish free-growing forest stands through basic silviculture. Such activities include juvenile spacing (beyond that required to meet basic silviculture obligations), fertilizing, pruning, and rehabilitation programs.

In the Boundary TSA, incremental silviculture activities have been mainly limited to juvenile spacing. Approximately 7000 hectares of juvenile spacing has occurred since 1975. There has also been a small amount of fertilization, amounting to about 760 hectares in the late 1980s and early 1990s, and about 412 hectares of pruning carried out from 1991 to 1997.

In the analysis, existing and future juvenile spacing, as required under basic silviculture, was accounted for by assigning existing stands less than 21 years and future regenerated stands to managed stand yield curves, which assume that, on average, stands will be managed to target densities. From my discussions with district staff, I note their concern about operationally managing to these target densities. If stands are not spaced then future stands may not achieve the minimum diameters currently assumed in the analysis for minimum harvestable ages within the expected timeframes, which in turn could impact future timber supplies. District staff advised me that selection of stands for juvenile spacing will continue to favour treating stands of higher initial densities, as per the *Boundary TSA Stand Tending Strategy 1998*. I note the district's concern and prior to the next determination I encourage staff to review and refine assumptions for silviculture treatments as outlined in the stand tending strategy.

Commercial thinning

In the previous determination for the Boundary TSA, I directed staff to identify candidate stands for commercial thinning and assess the impact of this practice on the projected short-and long-term timber supply. District staff examined stands for commercial thinning in the TSA and concluded that given the current timber supply projections, commercial thinning strategies are not a priority to offset potential future timber supply reductions. For this determination I consider these assumptions to be reasonable.

**(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,**

Utilization and decay, waste and breakage

I have reviewed the information regarding the utilization standards and the decay, waste and breakage factors assumed in the analysis for the Boundary TSA, and I am satisfied that these factors were appropriate.

**(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production,**

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply they must be considered in AAC determinations.

To manage for resources such as water quality, soil stability, wildlife and aesthetics, and to avoid concentrating harvesting-related disturbance in particular areas, operational practices limit the size and shape of cutblocks and maximum levels of disturbance in any given area.

For the analysis, the Boundary TSA was divided into overlapping management zones to model biodiversity, adjacency and current forest management. The percentage of the timber harvesting land base within each zone was about 81.7 percent in the IRM zone, 15.5 percent in the mule deer winter range zone, and about 3 percent in the community watershed zone. As the zones overlap, they add to more than 100 percent. In addition, biodiversity requirements apply across the entire forest land base. Specific forest cover objectives for visual quality, water management, wildlife, fire-maintained ecosystems and biodiversity are discussed in corresponding sections below.

*- cutblock adjacency and green-up*

In the previous determination for the Boundary TSA, I requested that staff examine the cutblock adjacency requirements in the TSA. During the gathering of data for the Boundary TSA analysis, district staff in consultation with licensees, reviewed the adjacency constraints guiding current practice, and developed a forest cover constraint to reflect current practice as required under the Forest Practices Code.

In the analysis, the adjacency objectives in the IRM zone were applied whereby a maximum of 25 percent of the timber harvesting land base could have trees less than 3 metres tall at any time. In the analysis, the disturbance limits were applied to approximate the operational requirements for cutblock adjacency and cutblock size.

However, following the completion of the analysis, a green-up height of 2.5 metres for stocked areas and 3 metres for not adequately stocked areas was established for the Boundary TSA through the Kootenay-Boundary Higher Level Plan Order.

Sensitivity analysis showed that reducing green-up height to 2 metres—while assuming a disturbance limit of 25 percent—had a very slight upward impact of 0.1 percent on the maximum even-flow forecast.

The sensitivity analyses showed that implementation of the green-up requirements established by the Kootenay-Boundary Higher Level Plan Order would have no impact timber supply, and as a result, I acknowledge the difference but make no adjustment on this account for this determination.

*- visual resource management*

Careful management of scenic areas visible from communities, public use areas and travel corridors is an important IRM objective. The Forest Practices Code enables the management of visual resources by providing for scenic areas to be identified and made known, and by providing for the establishment of visual quality objectives (VQOs). To achieve this, visual landscape inventories are carried out to identify, classify and record visually sensitive areas. On completion of such an inventory, a specialist may derive recommended visual quality classes (RVQCs, i.e.: 'Preservation'; 'Retention'; 'Partial Retention', 'Modification' or 'Maximum Modification') to identify levels of alteration that are appropriate for particular areas. The Forest Practices Code has provisions for these areas to be identified by the district manager or in a higher level plan, and for these areas to be made known to licensees. When this has been done and an RVQC has become current practice, it can be incorporated into a timber supply analysis, preferably as a VQO established by the district manager or contained in a higher level plan. Established VQOs reflect the desired level of visual quality, based on the physical characteristics and social concern for an area, and seek to balance the perceptions and needs of people with the social and economic needs of the province.

To achieve the VQOs, constraints are placed on timber harvesting, road building and other forest practices. The constraints, which are based on experience, research findings and public preferences, are expressed in terms of "forest cover" requirements that relate to the maximum percentage of a "viewshed" that may be harvested at any one time, and to 'visually effective green-up' (VEG)—the stage at which a stand of reforested timber is perceived by the public to be satisfactorily "greened-up" from a visual standpoint.

In the Boundary TSA, draft VQOs were developed in 1996 that recommended managing approximately 37 662 hectares, equal to 13 percent of the timber harvesting land base, based on Preservation, Retention, Partial Retention, and Modification visual quality classes. As the VQOs were draft at the time of the analysis, the district felt it appropriate not to include them in the maximum even-flow forecast, but to examine them in sensitivity analysis. The sensitivity analysis examined constraints that reflected draft Retention and Partial Retention classes by setting the maximum percentage of productive forest land permitted in each class allowed to be covered with trees less than 6 metres tall. The sensitivity analysis showed no effect on the maximum even-flow forecast. However, the sensitivity analysis did not reflect 337 hectares, which are currently classed as draft Preservation VQOs, and potentially would not contribute to the timber harvesting land base if harvesting is eventually precluded in this area. Nonetheless, given the stable timber supply forecasts and the relatively small area involved, I consider the implications to timber supply to be negligible in any event.

I am aware that the Kootenay-Boundary Higher Level Plan Order has provisions for establishing scenic areas in the Boundary TSA. District managers in the Nelson Forest Region have made a commitment to establish VQOs within the mapped scenic areas for KB HLP Order within a three-year period.

The Granby Wilderness Society and Friends of the Granby Environmental Society observed that the visual quality maps as described in the data package are draft, yet the district manager's 1999 forest development plan letter instructs licensees to use them. They submit that these areas should be included as part of the base case as is the case for other TSAs in the Kootenays. The district manager advised me that while the letter requests licensees to consider the draft VQOs, it is not mandatory.

As mentioned, the sensitivity analysis results indicate no impact from the draft Retention and Partial Retention VQOs, and I consider the 337 hectares of draft Preservation VQOs not to be significant in terms of timber supply impacts. I am aware that once the scenic areas are established for the TSA, the total area classed as Preservation may vary. Nonetheless for the purposes of this determination, I have concluded that the timber supply is not likely to be sensitive to the ongoing implementation of visual management objectives. I note that there are provisions in the KB HLP Order for establishing scenic areas within 3 years, which will provide improved information for the next determination.

*- recreation areas*

Recreation is an important use of the forest resources in the Boundary TSA given the proximity to several provincial parks, recreation sites and trails. Recreation activities in the TSA include hiking, mountain biking, fishing, hunting, boating, backcountry recreation, snowmobiling, skiing and wildlife viewing.

Two significant trails in the TSA are the Trans Canada Trail and the Dewdney Trail. In the analysis, no deductions were applied to areas along the Trans Canada Trail as harvesting may occur along the trail, given limitations on timing and type of harvesting. The Dewdney Trail, designated as a higher level plan in 1995, passes through the southern portion of the TSA. The higher level plan area covers 320 hectares within the TSA, of which about 128 hectares were inadvertently included in the timber harvesting land base. The other 192 hectares of the trail crosses private lands or lands excluded from the productive forest land base. In my determination, as noted in 'Reasons for decision', I have accounted for an overestimation of 128 hectares in the size of timber harvesting land base. This represents a slight downward impact on the timber supply in the short to long term.

*- identified wildlife*

Under the *Forest Practices Code of British Columbia Act*, identified wildlife are those wildlife species that have been approved by the chief forester and deputy minister of Environment, Lands and Parks or designate as requiring special management. The province's Identified Wildlife Management Strategy (IWMS) for dealing with endangered, threatened, vulnerable, and regionally significant species which have not been accounted for with existing management strategies—such as those for biodiversity, riparian management, ungulate winter range or through the application of other forest cover constraints—was announced on February 19, 1999.

Volume I of the IWMS lists several species which may occur and require future consideration in the Boundary TSA, including the rubber boa, racer, gopher snake, American bittern, northern goshawk, ferruginous hawk, prairie falcon, long-billed curlew, Lewis's woodpecker, white-headed woodpecker, bobolink, fisher, grizzly bear (discussed below), mountain goat, and bighorn sheep. There is also an identified plant community—the pine/cottonwood/snowberry plant association in the TSA. The wildlife species identified in Volume I will be managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures, or through other management practices specified in higher level plans. An 11-hectare WHA has been established over the pine/cottonwood/snowberry plant community, which is outside the timber harvesting land base. Volume II, which has yet to be released, may identify additional species and plant communities.

The North Okanagan Naturalists' Club notes that two species listed at risk in Table 1 of the (analysis) report do not occur in this TSA: the long-billed curlew and the ferruginous hawk. As noted above, Volume I of the IWMS identifies those species that may occur, but does not indicate that they have been confirmed to be present. The listing strives to ensure that species with limited populations are not overlooked in areas where there is some potential for them to occur.

In the joint submission from the Granby Wilderness Society and Friends of the Granby Environmental Society, they note that identified wildlife measures are provincial policy but are not mentioned (in the data package and information report). They submit that a land base reduction of 1 to 2 percent is needed to account for wildlife habitat areas. The Kettle Range Conservation Group says the harvest level should reflect the needs of seclusion–dependent species (marten, lynx, caribou, elk and grizzly) and species that are dependent on clean, cold waters such as salmon and bull trout. The group says that since Canada does not have protective legislation for imperilled species, many of which cross the border from the U.S. where they are protected, they should be given priority at the local level.

Based on provincial data accumulated on the habitat requirements of the identified species, the estimated impact of management has been projected at 1 percent of the short-term harvest level for the province.

I am mindful that only one WHA has been established in the Boundary TSA to date, comprising a small area outside of the timber harvesting land base. It is not possible in this

determination to specify the exact location or precise amount of additional habitat area that will be required within the timber harvesting land base to implement the IWMS. Nonetheless, I acknowledge the occurrence of identified wildlife in this TSA, and recognise the province's commitment to implement the IWMS, given a 1-percent impact to short-term timber supply provincially. Therefore, I find it appropriate to account for a 1-percent impact on timber supply, and I will discuss this further under 'Reasons for decision'. I encourage staff in the resource ministries to establish WHAs prior to the next determination for the Boundary TSA.

*- grizzly bear habitat*

Grizzly bears are one of 15 wildlife species identified at risk in the Boundary TSA. In addition, the grizzly bear population in the Kettle-Granby area is considered to be threatened.

Since 1993, a number of measures have been implemented to assist in the conservation of the grizzly population in the Boundary TSA including: a ban (still in-effect) for grizzly bear hunting in the Boundary forest district; mapping of key grizzly habitat areas; a survey of the grizzly bear population and habitat; creation of the Granby and Gladstone provincial parks; *Grizzly Bear Guidelines 1998* developed by the Boundary Forest District, with landscape- and stand-level strategies; consideration of district grizzly bear guidelines in forest development plans (FDPs) including access management, timing of resource activities, timber harvesting, important habitats and post harvesting treatments; road closures and gating adjacent to the Granby Provincial Park; and, a commitment to develop a grizzly bear recovery plan for the Kettle-Granby area. I am advised that work on the recovery plan is expected to begin in 2002. The plan is intended to address habitat protection, access management, reduction of bear-human conflicts, protected area management, improving public information and education, and research and monitoring of populations.

As the recovery planning process has not yet been developed, specific management measures and access restrictions were not included in the maximum-even flow forecast. Nonetheless, current practices in the Boundary TSA follow the *Grizzly Bear Guidelines 1998*, which contain guidelines for access management for grizzly bear protection, in particular the access deferrals contained in the Access Management Strategy for Interim Landscape Units B-9, B-10, and B-11. The strategy guides where forestry work is permitted at any time and provides suitable areas for the bears that are distant from human activity at all times. The area covered by the strategy — 112 049 hectares of the timber harvesting land base — is divided into compartments where harvesting is permitted or deferred for a period of time. The harvesting status (permitted or deferred) of the compartments alternates about every five years. A sensitivity analysis investigated the potential impacts of deferring access for either 5 or 20 years. Results showed no impacts to timber supply when the harvesting status was deferred within the compartments based on a 5-year cycle. When harvesting was deferred based on a 20-year cycle, the maximum even-flow forecast was impacted in the eighth and twelfth decades. To achieve a steady flow over the first 10 decades with a 20-year cycle, the harvest level would be 739 000 cubic metres per year, which is 1.3 percent lower than the maximum even-flow forecast. The current AAC forecast of 700 000 cubic metres per year was achievable under both access management scenarios.

Public input from Pope & Talbot expressed the opinion that since the development of the recovery strategy is still at an early stage, it would be premature to consider the potential impacts as part of the base case. On the other hand, submissions from individuals and interest groups such as the Granby Wilderness Society, North Okanagan Naturalists' Club and Boundary Naturalists submitted that current and potential timber supply constraints due to the protection of grizzly bears should be included in the base case. Furthermore, one submission states that Dr. Brian Horejsi's report (*The Endangered Granby-Gladstone Grizzly Bear Population – A Conservation Biology Analysis for Recovery*) stressed the need for zero mortality, a network of security areas and a drastic reduction in AAC and in road access, and these strategies should be implemented and modelled.

One submission states that the access guidelines, as contained in the 1999 FDP letter, should be considered as current practice and modelled in the analysis. Another states that in roaded areas, a reduction of road densities should be modelled or tested in a sensitivity analysis. Also that the compartment system of alternate drainages around Granby Park is ineffective as non-active periods are too short. They submit that scientific data says non-active periods should be at least 30 to 35 years, therefore these periods should be modelled. Also modelling should look at harvest scheduling options that would control access and maintain low road densities in the most important habitat over the long term.

Input from the Granby Wilderness Society also expressed concern that the timber supply scenarios involve unacceptable rates of logging which destroy the ecological health of the Boundary's forest and the survival of wildlife populations such as the endangered Granby grizzly, as well as damage the Crown's financial interests in the forest resource. Other concerns were expressed about specific forest practices for grizzly bears, such as designating some areas as roadless and other areas as forage reserves. However, until the recovery plan is implemented it would be speculative in this determination to account for practices in the TSA beyond those currently approved by government.

Nonetheless, I am mindful of the concerns expressed by numerous submissions about grizzly bear management in the Boundary TSA, particularly about roads, road densities and access management. I asked staff to review Dr. Brian Horejsi's report, *The Endangered Granby-Gladstone Grizzly Bear Population – A Conservation Biology Analysis for Recovery*. BCFS research staff advised me that the report's general conclusion is correct in saying that if the grizzly bear population is to be recovered in this area to a secure or viable level, then a serious effort is needed. However, research staff also advise me that the data and analyses they have produced over the past 23 years in collaboration with researchers in the adjacent US state of Montana does not support or corroborate many of the findings in the report. In particular, staff have outlined to me that the reports conclusions on road densities are very contentious and they caution against accepting the assertions made in the report in this respect.

Notwithstanding areas of contention and disagreement, Dr. Horejsi's report and some of its findings, and other research-based studies are considered in approving forest development plans. In addition, government has indicated that Dr. Horejsi's report will be considered in the development of the recovery plan for the Kettle-Granby area.

I have carefully considered the studies, information and public submissions regarding the management of grizzly bear habitat. The management options are complex and require planning processing which involve both stakeholders and scientists. As such, the provincial recovery team has advised me that there are options that could provide a reasonable chance of a recovery strategy for the Kettle-Granby area and still work within the current policy framework. The recovery plan will address the primary management challenge, which is to manage road access. I have reviewed the district's strategy which defers road access and harvesting on a 5-year cycle on 112 049 hectares. The results of sensitivity analysis show that there is some flexibility in timber supply when restrictions to harvesting are tested, although it is noted that implementation of the recovery strategy could be more constraining on the timber supply than examined in the analysis. When the recovery plan is completed and approved, then I will reflect the implications of it in a future determination. I note that the intense views which came forward on this subject indicate that government should place a high priority on the completion of this plan. I am prepared to redetermine the AAC for the Boundary TSA sooner than the normal 5-year review requires if completion of the grizzly bear recovery plan indicates this is necessary.

*- ungulate winter range*

The ungulate winter range (UWR) zones for mule deer, which cover 44 620 hectares of timber harvesting land base, were based on a mapping study completed in 1994 and updated to 1998. The mule deer winter range area was made known as outlined in an August 1998 memo, "Procedures for Identifying and Approving Existing Ungulate Winter Ranges", that was jointly signed by the Ministry of Forests and the Ministry of Environment, Lands and Parks.

In the timber supply analysis, a green-up requirement was applied in the mule deer winter range whereby a maximum of 25 percent of the timber harvesting land base could have stands less than 3 metres tall at any time (as applied in the IRM zone), however no parameters were included for mature forest cover requirements.

MELP noted that the forest cover guidelines for UWR found in the implementation strategy of the KBLUP should have been modelled in the maximum even-flow forecast, with a suggestion to increase the age of trees retained for cover from age class 6 (100 to 120 years) to age class 8 (140- 250 years). Staff expect that UWR provisions will be finalized through an UWR management plan being developed jointly by government staff, industry and non-governmental organizations, which is scheduled to be completed by October 2003.

Sensitivity analysis examined, based on biogeoclimatic (BEC) zones, green-up requirements whereby a maximum of 25 percent of the timber harvesting land base could have trees less than 2.5 metres tall at any time. It also included a mature forest cover constraint that required a minimum of either 25 or 35 percent of the total forest area was greater than a minimum age of either 100 or 120 years, depending on BEC zone. Results of this sensitivity analysis indicated that the maximum even-flow forecast could still be reached with these requirements.

Granby Wilderness Society asked about managing winter ranges for other ungulates such as elk, white-tail deer and moose. MELP stated that biodiversity will not be meet in woodlots so it is important to adequately account for UWR outside of woodlots, and noted that the area has the largest deer populations in the province. District staff noted that there are many uncertainties around forest cover constraints for ungulates which should be addressed the management planning for UWR. As noted above this work will be completed in 2003.

I note that the Kootenay-Boundary Higher Level Plan Order did not specifically address UWR provisions, and it is not clear what the outcome will be from the work that is underway to complete provisions. Although the timber supply was not sensitive to the additional requirements applied for mature forest cover, it is likely that the final provisions for UWR could be more constraining that was modelled in the sensitivity analysis. This represents an unquantified risk to the timber supply, which I have accounted for as discussed further, under 'Reasons for decision'.

*- riparian areas*

Riparian areas occur along streams, around lakes and in wetlands. The *Riparian Management Area Guidebook* requires the establishment of riparian reserve zones (RRZ) and riparian management zones along waterways that exclude timber harvesting in some cases, and riparian management zones (RMZ) that restrict timber harvesting in order to protect riparian and aquatic habitats.

As comprehensive local stream and fish habitat inventories were not available for the analysis, BCFS staff used the stream feature codes found in the 1996 MELP Fisheries Stream Atlas to assign riparian buffers. The area netted out for RRZs and RMZs was calculated by multiplying the length of the water feature by the assigned buffer width. A total reduction of 5681 hectares or 2 percent of the timber harvesting land base was applied in the analysis. BCFS district staff confirm that the reductions applied for RRZs and RMZs in the analysis were based on the best available information. Staff from BCFS and the Ministry of Sustainable Resource Management (formerly with MELP) are currently working on a Fish Stream Inventory Project that will improve information about riparian habitat and is anticipated to be completed later this year.

The Granby Wilderness Society and Friends of the Granby Environmental Society submit that high value fish streams should include the reaches and sub-basins of the Kettle and Granby Rivers that provide habitat for red-and blue-listed non-game fish. They also question how small unmapped streams are accounted for in the analysis, and cite the conclusions of the *Riparian Management Audit* (Beaudry *et al*), which states that riparian management guidelines may have a larger impact than identified in the data package. District staff stated that the audit was carried out by the region during the early stages of implementing the Code. At the time, riparian reserves were somewhat larger than required, however riparain areas are expected to more closely reflect Code requirements over time. Staff also noted that the audit found the harvesting practices for riparian management to be excellent in the Boundary Forest District.

The district used the best information available at the time and is currently working on improving stream inventories, which will be available for the next TSR. I am satisfied with the assumptions applied in the analysis for riparian habitat, and I've made no adjustments. I look forward to reviewing the stream inventory project in the next determination.

*- community and domestic watersheds*

Community watersheds in the Boundary TSA cover about 3 percent of the timber harvesting land base. To reflect practices in the analysis, no more than 30 percent of the forested area in the zone could be covered by forest stands less than 9 metres tall at any time. These forest cover requirements were developed using the *Community Watershed Guidebook*, Interior Watershed Assessments for community watersheds, and consultation with BCFS and MELP hydrologists.

The KB HLP Order identifies provisions for consumptive-use streams, which are designed to reduce the impacts of forest development on some streams by increasing the streamside management zone (for S5 and S6 streams) above water intakes licensed for human consumption. Implementation of the higher level plan provision requires mapping of water intakes used for human consumption. District staff anticipate completion of the consumptive-use stream mapping in 2002. Currently, intake mapping is incomplete and therefore no constraints were applied in the analysis for these provisions.

The joint submissions from the Granby Wilderness Society and Friends of the Granby Environmental Society noted that the green-up height of 9 metres is insufficient in community watersheds and recent research is beginning to indicate that full hydrologic green-up occurs later. They suggested using a green-up height of 11 metres. Also, they noted that a 30-percent equivalent clearcut area (ECA) is very high for community watersheds and that 20 percent is more reasonable. Staff note that current timber supply modelling tools are not able to explicitly account for ECAs, instead a proxy is applied. District staff consulted with BCFS and MELP hydrologists, and confirmed that the 9 metre green-up height and 30 percent disturbance are appropriate for use in the analysis. This is consistent with current practice, including the guidance contained in the *Community Watershed Guidebook*.

I have considered the forest cover constraints applied in community watersheds to be reasonable and I have made no further adjustments. However, I note that impacts from the provisions for consumptive-use streams have not considered and I will take this into account as discuss below, under 'Reasons for decision'.

*- fire-maintained ecosystems*

The Forest Practices Code has classified fire-maintained ecosystems as natural disturbance type 4 (NDT 4). This NDT includes grassland, shrubland, and forested communities that normally experience frequent low-intensity wildfires. The KB HLP Order provides direction for restoring and maintaining fire-maintained ecosystems (FMEs). Draft FME management strategies identify initial stocking targets for shrublands, open range, open forest, and managed forest. The draft strategy was not included in the timber supply analysis as the strategy for the Boundary TSA was still under consideration at the time.

District staff recently completed mapping of open range, open forest and managed forest FMEs in the TSA. The open forest and managed forest FMEs comprise 49 275 hectares of timber harvesting land base. By definition, the open range area is outside the timber harvesting land base. Consistent with the KB HLP Order, current plans for managing FMEs in the Boundary TSA include the rehabilitation of forest-encroached areas back to open forest. This strategy will cover areas within and outside of the timber harvesting land base.

Subsequent to the timber supply analysis, a sensitivity analysis was undertaken to examine the potential timber supply impact of restoring 6320 hectares of timber harvesting land base to open forest, consistent with recommended stocking targets in the KB HLP Order strategies. For this analysis, it was assumed that areas managed as open forest would have forest stocking densities reduced from 2000 trees per hectare to 400 trees per hectare sometime over the next 40 years. Based on TIPSY modelling, projected volumes would be about half that expected for a fully stocked stand. The results showed that this regime could have up to a 1-percent impact on the timber supply in the long term.

I have reviewed the information and note that the results of the sensitivity analysis show that when the FME objective in the KB HLP Order is implemented, it will be more constraining on the timber supply than was modelled in the maximum even-flow forecast. As current plans are to annually restore a portion of the total 6320 hectares within the timber harvesting land base to open forest, I have considered the FME restoration to represent a downward pressure of about 1 percent, as discussed further in 'Reasons for decision'.

- *stand-level biodiversity*

Biological diversity, or biodiversity, is defined as the full range of living organisms, in all their forms and levels of organization. Biodiversity includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at the stand and landscape levels.

Stand-level biodiversity management includes retaining wildlife trees and patches (WTPs), within or adjacent to cutblocks to provide structural diversity and wildlife habitat. Table A3.1 in the *Landscape Unit Planning Guide* recommends retention rates for WTPs where landscape unit planning has been completed and objectives have been set or will be established concurrent with the wildlife tree retention objectives. This will be the case in the Boundary Forest District as there are plans to set objectives concurrently. To account for WTPs on the basis of these guidelines, volumes were reduced by 2.7 percent in the analysis.

A sensitivity analysis examined the impact of decreasing and increasing retention rates for WTPs. When the percentage of harvestable volume to be retained for WTPs was decreased from 2.7 percent down to 1 percent, results show a 1.7 percent increase in the maximum even-flow harvest level. When the percentage of harvestable volume to be retained was increased from 2.7 to 5.4 percent, results show a 2.7 percent decrease in the even-flow harvest level.

In Pope & Talbot's submission, they stated that the assumption that only 50 percent of WTP requirements will be met outside the harvesting land base has no documented rationale and is overly conservative. The *Provincial Wildlife Tree Policy and Management Recommendations* (February 2000) states that in the interior, 50 percent of the total WTP requirements are to be met from the timber harvesting land base. District staff noted that a review of licencee's silviculture prescriptions (SPs) for 2000 indicated that more than 50 percent of the WTPs were being located in the timber harvesting land base. District staff anticipate that this number will decrease to about 50 percent as old-growth management areas and other constrained areas are established or determined in the future.

The Granby Wilderness Society and MELP staff indicated that Table 20b from the *Biodiversity Guidebook* should have been used to calculate WTP impacts. District staff confirmed that they used Table 20a of the *Biodiversity Guidebook* based on the comment in the guidebook that this table could be used where biodiversity and wildlife tree objectives were going to be established concurrently.

I have considered the information regarding stand-level biodiversity, and I have noted the assumptions applied in the analysis vary somewhat from actual practices based on a review of SPs from 2000. However, in the future district staff have indicated that they expect practices to better reflect provincial guidelines for stand-level biodiversity as they progress with landscape-level planning. Thus for this determination, I accept that stand-level biodiversity has been reasonably accounted for in the analysis, and look forward to additional information for future timber supply analyses.

- *landscape-level biodiversity*

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that maintaining these conditions—together with connectivity of ecosystems and the maintenance of forested areas of sufficient size to maintain forest interior habitat conditions—will provide for the habitat needs of most forest and range organisms. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests. In accounting for landscape-level biodiversity in the analysis, the following modelling assumptions were made:

*1) landscape units*

The delineation and formal designation of "landscape units" is a key component of a sub-regional biodiversity management strategy. For the Boundary TSA, draft landscape unit boundaries were agreed to by the district manager and designated environment official in 2000. The biodiversity emphasis options (BEOs) were legally established as part of the KB HLP Order in December 2000. The draft landscape unit boundaries and final BEO assignments were used in the timber supply analysis.

*2) seral stage requirements*

Provincial policy direction from the *Landscape Unit Planning Guide* requires old seral requirements to be met as soon as the objectives are established for higher and intermediate BEO areas. If it is not possible to achieve old-growth targets in the higher and intermediate BEO areas, then old-growth management areas (OGMAs) are designated in mature forested areas to recruit old-growth forests. In lower biodiversity emphasis areas, one-third of old seral requirements must be met immediately with the full requirement being phased in over three rotations ("one-third drawdown").

At the time of the analysis, for each landscape unit and biogeoclimatic subzone/variant combination, a single-weighted forest cover requirement for each of the old plus mature and old seral stage requirements was modelled with provision for one-third drawdown in lower emphasis areas. Averaged old seral requirements were applied to reflect the policy that lower, intermediate and higher emphasis options would be assigned to 45 percent, 45 percent and 10 percent of the management area, respectively.

The KB HLP Order now provides target requirements for old and mature seral forest and requires that mature plus old requirements in low emphasis areas are to be met immediately. The KB HLP Order also prioritizes the areas from which the mature plus old requirements are to be met in a different manner than provided by provincial policy in order to meet specific objectives, such as connectivity.

Analyses completed for the KB HLP Order examined the three most affected landscape units in the TSA and showed that requirements for connectivity corridors could reduce the timber harvesting land base by about 4200 hectares, or by approximately 1 percent. However, after taking a further look at the data for one landscape unit, district staff believe that connectivity may have less impact because of other overlapping considerations, resulting in less than 1 percent impact on the timber supply.

A sensitivity analysis examined some of the components of the then draft KB HLP scenario, which included the mapped BEO assignments, mature forest retention targets, and forest cover requirements for scenic areas. Results showed that including these components reduced timber supply to 730 000 cubic metres per year, or about 2.5 percent less than the maximum even-flow forecast, over the 250-year analysis horizon.

*3) future ageing of non-contributing forests*

In the timber supply analysis for the Boundary TSA, forests outside the timber harvesting land base (non-contributing) were assumed to continue to age over time such that eventually all non-contributing forests were over 250 years of age.

The implications of this assumption are that no allowance is made for the possible influence that natural stand disturbances such as fire, insects or disease may have through time. As a result, in terms of landscape-level biodiversity, a larger proportion of the old seral requirements are assumed to be met over time by non-contributing forests in the analysis than may be realized operationally. District staff note that although there is a history of effective fire suppression in the Boundary TSA, there will likely be some natural disturbance

on the non-contributing land base at some point in the future. Timber Supply Branch staff agree that the continual ageing of the non-contributing forest is not reflective of expected stand dynamics. Public input also expressed concerns about the validity of these assumptions.

Sensitivity analyses examined alternative approaches to ageing of the non-contributing forests as follows. One approach assumed that the existing age-class distribution in non-contributing forest would remain the same over time. Results of this "static" or non-ageing approach showed that after four decades, the timber supply declined to 663 000 cubic metres per year, or 11.5 percent lower than projected in the maximum even-flow forecast. As outlined in the analysis report, the static approach assumes a level of natural disturbance that is unlikely, since future fire suppression will probably enable a higher proportion of the non-contributing forest to age over time than in the past.

The second approach examined the impact of assuming both the static approach and reducing the age at which forests are predicted to meet old-seral requirements by 40 years in the non-contributing stands. In this sensitivity analysis, the timber supply declined in decade 8 to 701 000 cubic metres per year, which represents a reduction of 6.4 percent as compared to the maximum even-flow forecast.

One submission asked about the calculations in the analysis report regarding the timing of achieving old-seral requirements. District staff confirmed that numeric and typographic errors were found in the analysis report, however they were verified as documentation errors only. The correct provincial standards, including timing of achieving old-seral requirements, were used in generating the forecasts in the analysis.

Public input also included concerns that the current approach would lead to the disappearance of old-growth forests from all valley bottom areas outside of parks and asked that the analysis model old-growth retention at any given time (not one-third at a time) and ensure representative retention outside inoperable areas. The Granby Wilderness Society commented that Figure 24 in the analysis report shows that some of the timber harvesting land base will be needed to meet seral stage targets for mature and old forest retention in the future. The society also said that another downward pressure results from the fact that much of the inoperable and park areas in the TSA are dominated by dry, rocky sites and do not meet the representation goals required to meet biodiversity objectives. Furthermore, given the limited extent of remaining old forests, the harvest forecast should consider the need to reserve all of these stands, including those in the timber harvesting land base. District staff noted that the analysis assumptions were based on current provincial policy contained in the *Landscape Unit Planning Guide*. Forest retention to meet old-seral requirements will be implemented both inside and outside the timber harvesting land base consistent with the requirements in the KB HLP Order.

I have considered the information regarding landscape-level biodiversity. I note the sensitivity of the timber supply to elements of the KB HLP Order and the accounting for ageing of the non-contributing forest. For this determination, I have considered the results of the sensitivity analysis for the KB HLP Order scenario that indicated a downward pressure on the timber supply of up to 2.5 percent. I am also taking into account uncertainty associated with connectivity requirements in the KB HLP Order. An analysis of the impact

of connectivity indicated a potential downward pressure of less than 1.0 percent on the timber supply. As well, I have considered the continual ageing of forests in areas outside the timber harvesting land base. I agree that it is unreasonable to assume these forests will age indefinitely. I have accounted for these factors as discussed below, under 'Reasons for decision'.

**(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber;**

Kootenay-Boundary Higher Level Plan Order

Portions of plans arising from strategic land use planning processes such as regional or subregional planning (land and resource management planning) may be declared as higher level plans under the Forest Practices Code. A higher level plan defined under the Forest Practices Code establishes government's social, economic and environmental objectives, thereby setting the resource management context for developing subsequent operational plans.

For the West Kootenay area, the Kootenay Boundary Land Use Plan (KBLUP) was completed and signed off by government in 1995. The Kootenay-Boundary Higher Level Plan Order, containing critical components of the KBLUP, was established by government in December 2000.

The majority of the recommendations arising from the KBLUP, and also contained within the higher level plan order, that are relevant to operations and timber supply are being implemented in the Boundary TSA and form part of current practice for operations in the area.

The Kootenay-Boundary Higher Level Plan Order was not all-inclusive, and some provisions which arose from implementation of the KBLUP were not included in the higher level plan order, either because they were already satisfactorily addressed by the Forest Practices Code (which was implemented after the 1995 KBLUP), because they did not affect operational or strategic planning and were determined to be handled through other means, or because the provisions were determined by government to result in unacceptable socio-economic impacts.

I am aware that current practice in the Boundary TSA is guided by the recommendations arising from the KBLUP. Some of these recommendations were used in the development of the assumptions for the 2000 timber supply analysis, and in some instances I have made further adjustments in this decision to better reflect the higher level plan order. I believe that the Kootenay-Boundary Higher Level Plan Order established by government, will provide greater clarity around the management of specific resource values in the Boundary TSA. If, during the period following the establishment of the higher level plan, management considerations for specific values become less or more constraining than those which guided this decision, then this can be factored into a future determination.

Harvest sequencing and profile

In the analysis, it was assumed that harvest priority is placed on those stands which have aged furthest beyond their minimum harvestable age. For the purposes of modelling, this is expressed through the use of a *relative oldest first* harvest rule.

I have reviewed the information regarding harvesting sequencing. I am satisfied that the analysis assumptions were appropriate in this regard.

**(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,**

Alternative rates of harvest

I have reviewed the information regarding alternative harvest flows for the Boundary TSA. I note that there is a substantial amount of growing stock available over the planning horizon, hence the timber supply forecasts are very stable. Given this stability, there are likely many alternative rates of harvest. For this determination, I am satisfied that the harvest flows presented in the analysis provide a suitable basis from which to evaluate the assumptions applied in the analysis.

Community dependence on the forest industry

The socio-economic analysis for the Boundary TSA details the impact of timber supply adjustments on local communities and the provincial economy. The leading employers and income generators of the Boundary TSA, based on the 1996 Census, are the forest sector employing 26 percent of the total labour force and generating 25 percent of the income, the public sector employing 23 percent of the labour force and generating 17 percent of the income, the tourism and business travel sector employing 17 percent of the labour force and generating 7 percent of the income, and government transfer payments, investment income and corporate pension plans generating 25 percent of the income.

The analysis reports that the current AAC of 700 000 cubic metres can support 663 person-years of direct forestry employment and 283 person-years of indirect/induced employment within the TSA. Provincially, including local employment, the current AAC can support at least 838 person-years of direct forestry employment and 939 person-years of indirect and induced employment. Annual provincial revenues associated with this AAC, including provincial income tax, royalties, stumpage and rent, total about 26.9 million dollars.

Public input from the Granby Wilderness Society and Friends of the Granby Environmental Society says the Timber Supply Review should include an environmental risk analysis of the various harvest projections, as this also relates to the social and economic objectives of the province. I agree that better tools are needed to assess environmental risk and I note there is work underway in the province to develop environmental risk and habitat supply modelling.

The Granby Wilderness Society says it is prudent to begin to reduce the harvest level now to allow for community adjustment, given that long-term community economic stability and sustainability, and minimization of adjustment costs are the cornerstones of the Crown's objectives.

A petition signed by 27 people and four other submissions say the socio-economic analysis is flawed and overlooks a number of factors, such as the significant subsidization of the forest industry; the forest industry's depletion of natural capital with severe long-term implications; the environmental degradation resulting from industry forestry, with unaccounted economic costs; maintaining an inflated harvest allows industry over-capacity and inefficiencies to continue, and it delays the transition to more diversification and value-added products; and, lost economic opportunities (tourism fishing, hunting, recreation, etc.).

The Village of Midway says that community is very heavily dependent on forestry for jobs and an industrial tax base. The Forest Economic Development Officer says the transition to secondary manufacturing has just begun and notes the importance of trading relationships between the primary licensees and small business. The submission says one of the best opportunities for investment results from wood being available through the Small Business Program.

Pope & Talbot says polling done regarding the Higher Level Plan showed that over 70 percent of people believe jobs and economic development are a priority. This indicates that economic growth is a significant issue for the majority of people, versus contrary views of the vocal minority, according to this submission.

Two submissions say the statement that the economy of the Boundary TSA depends on forestry is objectionable, given the 1996 census data and the extent of taxpayer subsidization of the industry. They say the trend is away from forestry-based employment and that tourism is the fastest growing industry. Another submission says as the TSA increasingly becomes a tourism and retirement destination, maintaining other social and economic values should be given greater weight. The Kettle Range Conservation Group says parks and wilderness areas support jobs for the long term, unlike forestry development.

Many of the issues raised in the public input submissions are beyond my jurisdiction, as described in Section 8 of the *Forest Act*. While I acknowledge that other sectors provide more total employment than the forestry sector, I note that this does not reduce the contribution to employment and community stability provided by the forestry sector. I have reviewed the socio-economic analysis, which used an established and sound methodology to evaluate the community dependencies for the Boundary TSA. I am mindful that communities within and outside of the Boundary TSA depend on the timber supply from the TSA, and that any adjustment to the harvest level will impact these communities.

**(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities;**

Timber processing facilities

*- existing and proposed mills*

I have reviewed the information regarding existing and proposed timber processing facilities, and I am mindful of the reliance of timber processing facilities on the volume harvested in the Boundary TSA.

**(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia,**

Economic and social objectives

*- Minister's letter and memorandum*

The Minister of Forests has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester: a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996 (attached as Appendix 4). The letter and memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He emphasized the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have considered the contents of the letter and memorandum in my determination of an AAC for the Boundary TSA.

*- local objectives*

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the Timber Supply Review where these are consistent with government's broader objectives. Many public responses were received regarding the information report and data package, and the timber supply and socio-economic analyses. The summary of public input is attached in Appendix 5.

The approval of the Kootenay-Boundary Land Use Plan (KBLUP) reflects the government's commitment to achieve the Crown's social and economic objectives for the region, including the Boundary TSA. The Kootenay-Boundary Higher Level Plan Order is further evidence of government's objectives for this area. Overall, the higher level plan order is expected to give greater certainty for both environmental values and the forest industry.

A number of submissions commented on harvest levels and allocation of the AAC in the Boundary TSA, the Timber Supply Review process, and management practices and approaches in the district and the province as a whole.

As discussed elsewhere in this document, the analysis accounts for management under the Forest Practices Code and includes many aspects of the KBLUP. Where necessary, I have accounted for adjustments in my determination in order to more accurately reflect the implications of current management in this TSA. In my considerations throughout this document I have attempted to account for the need to balance socio-economic and environmental benefits and risks both now and over time.

In summary, I am mindful of the wide and varied public input received and, where possible in this rationale, I have attempted to respond briefly to specific concerns. I note that some of the public input received refers to items beyond my mandate for consideration under the *Forest Act*, which relates specifically to the determination of AACs for TSAs and TFLs. Nevertheless, consideration of public input has been an important component of my determination for the Boundary TSA.

**(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.**

Abnormal infestations and salvage

Forest stands are susceptible to damaging agents such as wildfires, windthrow, and disease and insects. Timber volume losses due to insects and diseases that normally affect stands (endemic losses) are generally measured and accounted for during forest inventory sampling for existing stand volumes or through other sampling methods. Losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs). In the timber supply analysis it is necessary to estimate and account for the unsalvaged losses resulting from epidemic (abnormal) infestations on the timber harvesting land base that are not incorporated into volume estimates.

For the Boundary TSA, unsalvaged losses were estimated to be 850 cubic metres per year due to insects, 3825 cubic metres per year due to windthrow and snow damage, 1250 cubic metres per year due to retention tree mortality, and 60 cubic metres per year due to fire, totalling 5985 cubic metres per year.

The estimates of unsalvaged losses were derived using the *Method to Estimate Non-Recoverable Losses for Timber Supply Reviews* produced by BCFS Forest Practices Branch in cooperation with BCFS Research and Timber Supply Branches. Information was collected from BCFS pest management data, Forest Insect Disease Reports, forest development plan maps and consultation with BCFS regional forest health staff, protection staff and district staff. Where possible, the estimates attributable to each agent were based on long-term average losses adjusted for any projected salvage of the affected volume. In practice, the recovery of insect and disease attacked timber and blowdown is considered the highest harvesting priority for the district. The Small Scale Salvage Program has been re-established and complements salvage carried out by major licensees and the Small Business Forest Enterprise Program. District staff confirmed the estimates are reasonable based on improved information and methodologies since the last determination.

I note the estimate of unsalvaged losses due to wildfires seems to be low for a TSA of this size. District staff derived the estimate from historical data and confirm that this estimate of unsalvaged losses is an accurate reflection of current practice. For example, over the last decade there have only been small fires with effective fire suppression and quite effective salvage.

In my previous determination for the Boundary TSA, I requested that BCFS staff review the estimated timber loss due to *Armillaria ostoyae*. The previous analysis in 1994 accounted for an unsalvaged loss of 30 000 cubic metres per year attributed to root diseases. To address this issue as mentioned above, the district staff used the *Methods to Estimate Unsalvaged Losses for Timber Supply Reviews*. The guidelines consider endemic losses within stands greater than 30 years old to be captured in VDYP and consider losses in stands younger than 30 years to be accounted for by operational adjustment factors (OAFs). Therefore in the analysis, to account for *Armillaria ostoyae* in second-growth stands, adjustment factors ranging from 7 to 12 percent were applied, depending on the analysis unit. These percentages represent an increase from the standard provincial OAF estimate of 5 percent, and were based on BCFS research findings and consultation with the BCFS regional pathologist.

Subsequent to the analysis, ground survey data collected by BCFS district staff for Douglas-fir bark beetle infestations showed that the average number of trees attacked was higher than originally estimated. The estimate for unsalvaged losses due to Douglas-fir bark beetle was increased from 50 cubic metres per year up to 480 cubic metres per year. In addition, district staff reviewed the estimate for unsalvaged losses due to spruce beetle infestation and determined that the spruce beetle infestation should have been treated as a four-year average rather than a one-year event as included in the analysis. Therefore, the annual loss to account for spruce beetle infestation was reduced from 400 cubic metres per year to 100 cubic metres per year. In total, the two revised estimates resulted in a net underestimation of the unsalvaged losses of 130 cubic metres per year.

The Granby Wilderness Society and Friends of the Granby Environmental Society recommended that a sensitivity analysis examine the potential impacts of climate change on increasing beetle populations, root rot and potential for catastrophic fires. The Granby Wilderness Society also commented that the very low OAFs used in the analysis do not adequately account for a reasonable projection of losses, especially given climate change. Furthermore, they state that fire control and salvage may limit disturbance losses to some extent, but they generally have limited effect on larger stochastic events. I am mindful that climate change has been raised in a number of the timber supply reviews as a concern. Studies are ongoing into this complex issue and as information becomes available in the future, it can be reflected in future determinations. As mentioned above, the OAFs applied to account for root rot in second-growth stands were increased from the provincial standard of 5 percent to between 7 to 12 percent based on BCFS research.

In summary I find that the estimates for unsalvaged losses were reasonable. Although the estimate of unsalvaged losses for fires seemed low, I accept that this is reflective of historical trends. I am also mindful of the small underestimation of unsalvaged losses due to Douglas-fir bark beetle and spruce beetle. I do not consider these findings to introduce a risk to timber supply in this determination and I make no further adjustments for this factor.

**Reasons for decision**

In reaching my AAC determination for the Boundary TSA, I have considered all of the factors presented to me, and have reasoned as follows.

In the 2000 timber supply analysis, the 'current AAC forecast' showed that the current AAC of 700 000 cubic metres per year could be maintained for 10 decades before rising to a steady long-term harvest level of 749 000 cubic metres. The 'maximum even-flow forecast' showed that a harvest forecast of 749 000 cubic metres could be maintained over the entire analysis horizon.

Section 8 of the *Forest Act* requires me to consider a number of factors in the determination of an AAC for a timber supply area. In determining an AAC, my considerations identify factors which, when considered separately, indicate that the timber supply may actually be greater or less than that projected in the analysis. Some factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by introducing an element of risk or uncertainty to the decision, but cannot be reliably quantified at the time of the determination.

In determining the AAC for the Boundary TSA, the following factors may indicate an underestimation in the timber supply as forecast in the maximum even-flow.

1) *future roads, trails and landings* – based on revised estimates for future roads, trails and landings and a subsequent review of the assumptions, I accept that the future timber harvesting land base has been underestimated by less than 4 percent, which acts to increase the timber supply in the long term.

2) *use of select seed* – the current operational use of select seed, which was not accounted for in the analysis, indicates that timber supply could be up to 1.6 percent greater in the mid- to long-term.

3) *site productivity estimates* – site productivity of second-growth forests may be underestimated by up to 5.7 percent based on provincial data, however this affects the timber supply in the long term, and without local studies the exact magnitude of this underestimation is uncertain.

However, I have identified the following as quantified factors that are indicators of an overestimation of timber supply.

1) *existing road, trails and landings* – based on revised road-width criteria, the total area of existing roads was recalculated and resulted in reducing the timber harvesting land base by 782 hectares. This affects the timber supply in the short- to long-term.

2) *woodlots* – an additional 2581 hectares assigned to the woodlot program reduces the timber harvesting land base by this amount. This affects the short- to long-term timber supply.

3) *volume estimates for existing stands* – the residual volumes in stands that have been partially harvested since the last reinventory have been overestimated by VDYP and result in a small overestimation of the timber supply, totalling about 0.1 percent which acts to lower the timber supply in the short- to mid-term.

4) *recreation areas of significance* - a reduction of 128 hectares to account for the Dewdney Trail corridor represents a slight overestimation in timber supply in the short- to long-term.

5) *landscape–level biodiversity and scenic areas* - up to a 2.5 percent timber supply impact was projected after accounting for KB HLP's BEO assignment, mature forest retention targets, and provisions for scenic areas.

I have also identified the following additional factors that indicate that timber supply as projected in the maximum even-flow may be overestimated, but to a degree which cannot be accurately quantified.

1) *Identified Wildlife Management Strategy* - consistent with provincial policy, implementation of the IWMS is expected to affect timber supply by up to 1 percent over the entire planning horizon.

2) *ungulate winter range* - final provisions for ungulate winter range will likely be more constraining that was modelled, as only green-up requirements were included in the maximum even-flow forecast. Additional constraints for mature forest cover represent an unquantified risk to timber supply.

3) *connectivity corridors* - requirements for connectivity are included in the KB HLP Order. Although connectivity was not examined specifically in a sensitivity analysis, I have taken into account the results of an initial review of the impact of connectivity, which indicated a potential downward pressure of less than 1 percent on the timber supply.

4) *fire-maintained ecosystems* - when the FME objective as outline in the KB HLP Order is fully implemented, it will likely be constraining on the timber supply. I have considered this to represent a downward pressure of about 1 percent, based on the results of sensitivity analysis and the current plans to restore a portion per year of the total 6320 hectares of open forest within the timber harvesting land base.

5) *ageing of the non-contributing forests* - it is unreasonable to assume that all non-contributing stands will age indefinitely. The results of a sensitivity analysis show that if a more natural pattern of stand disturbance is modelled, then the timber supply could decline by up to about 6 percent in the mid- to long-term.

In consideration of those factors discussed above, I observed that in general, the factors that represent an upward influence on timber supply act in the long-term, and the factors that represent a downward influence on timber supply act mainly in the short-to long-term. While I have acknowledged the timber supply implications of each factor on its own merit, I am aware of the complexities associated with assessing their cumulative effect and risk to the maximum even-flow forecast. Hence, I requested that additional analysis be completed to provide me with an assessment of the interaction of these factors.

The additional analysis assessed the combined implications of the following parameters as compared to the assumptions applied in the maximum even-flow forecast.

- BEO assignments, mature forest retention targets, old forest retention targets with one-third drawdown in the lower emphasis areas,

- forest cover requirements for scenic areas,
- restoration of fire-maintained ecosystems,
- setting UWR older forest requirements at 55 percent,
- accounting for an IWMS affect on about 1 percent of the timber supply, and
- assuming that the non-contributing forests age do not age infinitely.

This scenario included some of the largest downward pressures and was not offset by any of the potential upward pressures. Results showed that compared to the maximum even-flow forecast, these components reduced the timber supply to 700 000 cubic metres per year for the next four decades, after which it declined to 656 000 cubic metres per year over the remainder of the planning horizon. However, in my view when the entire combination of upward and downward pressures are fully considered, the outcome will most likely result in a timber supply projection that is higher than 700 000 cubic metres per year in the long term (but possibly not in the short term). Also, I am mindful of the uncertainty around several factors that could affect the future timber supply, such as the ungulate winter range, managing grizzly bear habitat, and provisions for consumptive-use streams.

Nonetheless, I interpret the combined effects of the above parameters and the timber supply forecasts to indicate that the timber supply is relatively stable and that the harvest level can be maintained in the short term and still meet the current management objectives, constraints, and assumptions. However, it is not at all clear to me that an increase in the short term is possible without introducing the risk of a likely future decline. Accordingly, until some of the factors governing the mid-and long-term timber supply are more clear, I am unwilling to consider an increase at this time.

A number of submissions raised concerns about grizzly bear management as they pertain to land-use decisions and challenged my mandate with regard to decision-making and obligations under law. In regard to this determination, and in light of the decisions noted and my Guiding principles for AAC determinations outlined above, I cannot predict or presume what will be decided by government for the long-term management of grizzly bears in the Boundary TSA. I am aware that a recovery strategy for grizzly bears in this area is a provincial priority and managing road access will be addressed through this plan. Once the recovery plan is in place I will take the plan into account accordingly.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

For all these reasons, although the timber supply analysis indicated that the harvest level could be increased, until more information is know about parameters which are currently uncertain I am not prepared to increase the harvest level. Nonetheless, I have considered the risks of these uncertainties and believe that the current harvest level of 700 000 cubic metres per year can be attained in the short term without compromising other objectives as outlined above.

**Determination**

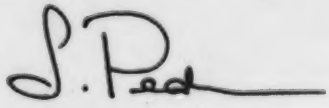
It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects the socio-economic objectives of the Crown for the area, that ensures long-term integrated resource management objectives can be met, and that reflects current management practices can best be achieved in the Boundary TSA at this time by establishing an AAC of 700 000 cubic metres.

This determination is effective January 1, 2002, and will remain in effect until a new AAC is determined, which must take place within five years of the date of this determination. This AAC determination is exclusive of woodlot licences.

**Implementation**

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff to undertake the following list of tasks and studies that I have mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects depends on available staff resource time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Boundary TSA. I recommend that staff:

- refine operability mapping, particularly in difficult terrain;
- complete a study that provides information about unstable terrain for the purposes of replacing Es1 and Es2 based on terrain stability mapping;
- refine the methodology for estimating future roads, trails and landings;
- review the assumptions to decrease the uncertainty about site productivity estimates;
- refine the assumptions for minimum harvestable ages;
- review the assumptions for incremental silviculture (target densities) as outlined in the stand tending strategy.



Larry Pedersen
Chief Forester
October 25, 2001

## Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, reads as follows:

### Allowable annual cut

**8.** (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silvicultural treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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## Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

### Purposes and functions of ministry

**4.** The purposes and functions of the ministry are, under the direction of the minister, to

(a) encourage maximum productivity of the forest and range resources in British Columbia;

(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

(d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and

(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

## Documents attached:

**Appendix 3:** Minister of Forests' letter of July 28, 1994

**Appendix 4:** Minister of Forests' memo of February 26, 1996

**Appendix 5:** Summary of Public Input

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

**Re: Economic and Social Objectives of the Crown**

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of British Columbia
Minister of Forests
Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
Ministry of Forests
OFFICE OF THE MINISTER

# MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: **The Crown's Economic And Social Objectives Regarding Visual Resources**

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis*.

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests

# Boundary Timber Supply Area
# Timber Supply Review

## Summary of Public Input

BC Ministry of Forests
Boundary Forest District
136 Sagamore Avenue
PO Box 2650
Grand Forks, BC
V0H 1H0

**October, 2001**

This is a summary of the public input received on the Timber Supply Review in the Boundary Timber Supply Area. This summary does not assess the feasibility or validity of the input or whether it relates to the clearly defined mandate of the chief forester in the allowable annual cut determination.

# Boundary Timber Supply Area

## Background

As part of the review of timber supply in the Boundary Timber Supply Area (TSA), two opportunities were provided for public input. The first followed release of the Boundary Timber Supply Area *Data Package* and *Information Report* in September 1999. The *Information Report* was a non-technical summary of the draft data and management assumptions that were to be applied in reviewing the timber supply for the Boundary TSA. A 30-day review period, ending October 15, 1999, was provided for the public to comment on these documents.

On November 23, 2000 the British Columbia Forest Service released the *2000 Boundary Timber Supply Area Analysis Report* and *Public Discussion Paper*. The public was encouraged to review and comment on the accuracy of the information in these documents and to provide additional information during the 60-day review period that ended January 29, 2001.

This report summarizes the input received during both public review periods. This information was provided to the chief forester for his consideration when he reviewed the allowable annual cut (AAC) for the Boundary TSA. The first section of this summary outlines the public review process implemented by the Forest Service, and describes the types of public input received. The second section summarizes the public input in sufficient detail to indicate the range of input received. The original submissions (with personal identifiers removed in accordance with the *Freedom of Information and Protection of Privacy Act*) can be reviewed at the Boundary Forest District office.

## Public Review Process and Response

Boundary District staff actively solicited public input on the Timber Supply Review in the Boundary TSA through the following actions:

- newspaper advertisements were placed, advising of the availability of all documents for review by the public.
- copies of all the documents were made available to the local media.
- about 24 copies of the news release and *Information Report* were mailed to key stakeholders in the TSA.
- the *Data Package* and the *Boundary Timber Supply Area Analysis Report* were available at the district office.
- the Timber Supply Review documents were discussed with the local MLA.
- follow-up telephone calls were made to First Nations regarding the mailing.
- 40 copies of the *Analysis Report* and *Public Discussion Paper* were mailed to key stakeholders in the TSA, such as First Nations, licensees, local environmental groups and local governments. Meetings or presentations were offered.
- about 200 copies of the *Public Discussion Paper* were mailed to stakeholders in the Boundary area.

Two groups requested presentations on the Timber Supply Review. On November 23, 2000 Boundary District staff met with three representatives from Pope and Talbot, and on January 13, 2001 staff attended a general meeting of woodlot licensees with 29 people in attendance.

The Boundary Forest District also received ten written submissions on the *Data Package* and 164 submissions on the *Analysis Report* (see Appendix 1).

## Public Input

In this section, public input on the information presented in the Timber Supply Review documents for the Boundary TSA is summarized under the following headings:

- Data Package (and Information Report);
- Timber Supply Area Analysis Report (and Public Discussion Paper);
- Other comments.

### Data Package

#### Size of the Harvesting Land Base

One submission says the use of the 1991 operability study seems reasonable, while two others question whether the difficult terrain that is contributing to timber supply is in fact being harvested.

The joint submission from the Granby Wilderness Society and the Friends of the Granby Environmental Society (the "joint submission") questions why terrain stability mapping was not incorporated in the analysis. The groups say mapping was used in most other TSAs and is more reliable than using environmentally sensitive areas for fragile or unstable soils. They also say areas with significantly fragile or unstable soils (E2s) within high value fish stream watersheds and other domestic watersheds should be treated as they are in community watersheds (i.e., a 50-percent area reduction).

The joint submission also expresses concern about potential mistyping of some high elevation sites that likely have low productivity. They recommend removing from the timber harvesting land base (THLB) areas labelled alpine with a forest type as well as those labelled alpine, or the removal of stands mapped as parkland or alpine tundra.

Pope and Talbot (P&T) questions why woodlots are excluded from the analysis and says the AAC associated with them should be an output of, not an input to, the analysis.

The joint submission says, given present controversies over First Nations' land and timber rights, not adjusting the land base for this factor is unrealistic. An individual submission questions why Granby and Gladstone Parks are not being accounted for in the analysis, and the AAC reduced accordingly.

#### Roads, Trails and Landings

The joint submission says the right-of-way widths used to calculate the loss of productive land to roads are too narrow. The groups recommend a 20-metre width for secondary roads and a 16-metre width for logging roads, for both existing and future roads. This submission also maintains roads should not be removed from the productive forest but remain part of the forest land base and be considered permanently early seral.

P&T's submission says allowances for roads and trails appear reasonable, but the netdown for landings is high based on their experience. The company states agreement that future road allowances will start declining as the TSA is accessed and says this pattern must be accurately reflected and described in the analysis.

The joint submission says that regardless of the requirement to rehabilitate skid trails, some degree of detrimental soil disturbance will occur. They say assuming no disturbance is not realistic and suggest another two to three percent netdown to account for productivity lost to trails.

#### Existing Forest Inventory

Two submissions express concern about the on-the-ground forest inventory as the *Data Package* does not provide actual figures, but only estimates and projections.

### Expected Rate of Growth

P&T says genetic improvement programs are expected to result in significant yield improvements and these should be reflected in the base case, as should Old Growth Site Index (OGSI) adjustments.

Two submissions question the growth rates expected for managed stands and say tree plantations across the province are not performing as expected. The submissions note problems with forest health and wood quality and strength. They say if increased yields should occur, they should accrue to future generations and not be counted as current gains.

The joint submission says the operational adjustment factor (OAF 2) used to account for volume losses to diseases and pests should be increased to 25 percent, noting that recent studies show 20 percent losses just due to root disease.

### Regeneration Factors

P&T requests clarification on how the age of plantation stock is considered in calculating regeneration delay. The joint submission says assumptions about the treatment of backlog "not satisfactorily restocked" (NSR) areas appear to be overly optimistic given recent budget cuts and reductions in Forest Renewal funding.

### Silvicultural Systems

Two submissions question how partial cutting and uneven-aged management will be modelled in the analysis and note a lack of information on this in the *Data Package*.

Two other submissions say that unless the Forest Service is committed to harvesting the Boundary TSA into economic and ecological collapse, it is imperative that ecosystem-based, alternative systems be modelled in the base case, not as an alternative to but as a replacement for clearcutting.

P&T requests clarification how the Fire Maintained Ecosystem Restoration program will be modelled.

### Visual Quality

The joint submission notes that visual quality maps are described as draft in Table 3, yet the district manager's 1999 forest development plan (FDP) letter instructs licensees to use them. These areas should be included as part of the base case as in other Kootenay TSAs, rather than just a sensitivity analysis, according to this submission.

### Wildlife

The Kettle Range Conservation Group says the harvest level should reflect the needs of seclusion-dependent species (marten, lynx, caribou, elk and grizzly) and species dependent on clean, cold waters such as salmon and bull trout. The group says that since Canada does not have protective legislation for imperiled species, many of which cross the border from the U.S. where they are protected, they should be given priority at the local level.

The joint submission notes that Identified Wildlife Measures that are provincial policy are not mentioned, and maintains that a land base reduction of one to two percent is needed to account for Wildlife Habitat Areas.

Six submissions comment on grizzly bear management as it affects the Timber Supply Review. P&T expresses the opinion that since the development of recovery strategies is still at an early stage, it would be premature to consider the potential impacts as part of the base case.

The other five submissions maintain that current and potential timber constraints due to the protection of grizzly bears should be included in the base case. Some of the key points made in these submissions are:

- Dr. Brian Horejsi's report (*The Endangered Granby-Gladstone Grizzly Bear Population – A Conservation Biology Analysis for Recovery*) should be modelled in the base case.
- access guidelines, as contained in the 1999

FDP letter, should be considered as current practice and modelled in the analysis.

- maintaining all existing roadless areas and large, connected security zones is crucial to preserve a corridor between the two parks and to prevent the Granby area being cut off from the Arrow Lakes area.
- reduction of road densities in roaded areas should be modelled or tested in a sensitivity analysis.
- the compartment system of alternate drainages around Granby Park is ineffective as non-active periods are too short. Scientific data says non-active periods of at least 30 to 35 years should be modelled.
- modelling should look at harvest scheduling options that would control access and maintain low road densities in the most important habitat over the long term.

### Riparian Areas and Watersheds

The joint submission says high value fish streams should include the reaches and sub-basins of the Kettle and Granby Rivers that provide habitat for red- and blue-listed non-game fish. The groups also question how small unmapped streams are accounted for in the analysis, and note the conclusions of the Riparian Management Audit (Beaudry *et al*) that riparian management guidelines may have a larger impact than identified in the *Data Package*.

Two submissions say water is one of our most precious life-sustaining resources and the precautionary principle must be applied. They say terrain stability analyses and maximum stream buffers must be modelled in the base case for all watersheds.

P&T says they support a sensitivity analysis for watershed management guidelines, but say inclusion in the base case would be premature since identification of specific watersheds is still at an early stage.

The joint submission says the green-up height of nine metres is insufficient, noting that recent research is beginning to indicate that full hydrologic green-up occurs later. They suggest use of 11 metres. The groups also say a 30-percent equivalent clearcut area (ECA) is very high for community watersheds and that 20 percent is more reasonable.

### Stand Level Biodiversity

P&T says the assumption that only 50 percent of wildlife tree patch (WTP) requirements will be met outside the harvesting land base has no documented rationale and is overly conservative.

The joint submission says the WTP retention numbers are too low, and that Table 20(b) in the *Biodiversity Guidebook* should be used because landscape level biodiversity emphasis options (BEOs) have not been established. The groups also say the assumption that WTPs will be larger than two hectares and contribute to meeting seral stage requirements is not realistic, noting that other TSAs (e.g., Kootenay Lake) assume as few as 10 percent of WTPs will be that large.

### Landscape Level Biodiversity

P&T says the example calculations in Section 6.4.1 imply that old-seral requirements must be achieved by the beginning of the third rotation rather than at the end as stated in the *Biodiversity Guidebook*. The company requests clarification.

Two submissions say the current approach will lead to the disappearance of old-growth forests from all valley bottom areas outside of parks and ask that the analysis model old-growth retention at any given time (not one-third at a time) and ensure representative retention outside inoperable areas.

The joint submission makes a number of points on this issue, including:

- the 1999 FDP letter instructs licensees to use interim landscape units and BEOs and

therefore these should be modelled in the base case.

- forest cover requirements should also reflect full implementation of mature+old.
- protected old and mature were already counted once in setting cover requirements and should not be double-counted in the analysis.
- the assumption that stands in the non-contributing land base will age over the duration of the analysis horizon is completely unrealistic.

### Non-Recoverable Losses

The joint submission recommends a sensitivity analysis on the potential impacts of climate change on increasing beetle populations, root rot and potential for catastrophic fires.

### Socio-Economic Factors

The joint submission says the Timber Supply Review should include an environmental risk analysis of the various harvest projections, as this also relates to the social and economic objectives of the province.

Two submissions say the statement that the economy of the Boundary TSA depends on forestry is objectionable, given the 1996 census data and the extent of taxpayer subsidization of the industry. They say the trend is away from forestry-based employment and that tourism is the fastest growing industry. Another submission says as the TSA increasingly becomes a tourism and retirement destination, maintaining other social and economic values should be given greater weight. The Kettle Range Conservation Group says parks and wilderness areas support jobs for the long term, unlike forestry development.

The Forest Economic Development Officer says the transition to secondary manufacturing has just begun and notes the importance of trading relationships between the primary licensees and small business. She says one of the best opportunities for investment results from wood being available through the Small Business Program.

An individual submission makes three recommendations:

- reflect the complete economic base in describing the economy.
- examine the short- and long-term implications of alternative cut rates on the entire economy.
- involve the ministers of health, small business, women's equality and environment in establishing economic and social objectives.

## Timber Supply Area Analysis Report

### Land Base Factors

One submission says it is not logical to reduce the THLB by the area of trails and landings since they do become naturally regenerated or can be planted, and the effect would simply be a reduction in site class. The Ministry of Environment (now Ministry of Land, Water and Air Protection) submission (MoE) says roads should be considered early seral, and not be deducted from the THLB. The ministry also questions the road widths used, saying they do not reflect reality.

### Expected Rate of Growth

One submission suggests the discussion about the likely underestimation of site index in dense lodgepole pine stands probably also applies to pine stands severely infected with dwarf mistletoe which are particularly common in the northwest part of district. This individual questions if there are not useful correlations between ecosystem type and site index that could be used instead of tree measurements in old, diseased and dense stands.

The Granby Wilderness Society (GWS) makes several points on this topic:

- they agree with treating the results of the Old Growth Site Index study as unproven theory.
- the growth curves used in managed stands (TIPSY) are unsubstantiated for this area and are overly optimistic.
- OAF2s are not realistic.
- the minimum harvestable age should be culmination age.

### Not Satisfactorily Restocked Areas

The GWS says that given the uncertainty about funding for silviculture work, less optimistic assumptions about the rehabilitation of backlog NSR areas should be used.

### Wildlife

The GWS says the base case should include strategies for the recovery of the numerous red-listed species in this TSA, such as ECA management and increased sediment control in the various sub-basins of the Kettle River where red-listed fish species occur.

The North Okanagan Naturalists' Club notes that two species-at-risk listed in Table 1 of the report do not occur in this TSA: the long-billed curlew and the ferruginous hawk. An individual submission says ungulate winter range (UWR) should be treated by burning or selective logging, while MoE says the forest cover guidelines for UWR in the Kootenay-Boundary Land Use Plan (KBLUP) should have been modelled.

### Grizzly Bear Management

Seventeen submissions, including one co-signed by 60 individuals, comment on the issue of grizzly bear management and recovery strategies. The following are the key comments:

- reserves should be selectively logged to increase small mammals and berries, which are grizzlies' chief food.
- high emphasis biodiversity designation in the area between the parks should be re-established, as indicated in the original KBLUP recommendations.
- significant reserves to provide connectivity and buffers on avalanche tracks, riparian areas, wetlands and other key grizzly habitats should be allowed for.
- a moratorium on the extension of roads and logging into the remaining roadless areas in the recovery area is requested.
- the massive network of logging roads in the area fragments and degrades habitat, and provides access to illegal hunters.
- Dr. Horejsi's strategy, which stresses the need for zero mortality, a network of security areas and a drastic reduction in AAC and roads, should be implemented and modelled.

Horejsi's submission also suggests the chief forester should recommend to the minister of forests that all roadless land in the TSA be "designated areas" to provide security of biological processes and life for all wildlife, but specifically for the Granby grizzly.

### Watersheds

The GWS says the minimal cover constraints indicated for community watersheds do not reflect the ECA recommendations that normally result from watershed planning processes. The society says similar cover constraints should apply to all domestic watersheds, and constraints for high value fisheries watersheds and those containing red- and blue-listed species should also be considered.

### Biodiversity

The GWS says Figure 24 of the *Analysis Report* shows that some of the THLB will be needed to contribute to meeting seral stage targets for mature and old in the future. As well, the society says another downward pressure results from the fact that much of the inoperable and park areas in

the TSA are dominated by dry, rocky sites and do not meet the representation goals required to meet biodiversity objectives. Given the limited extent of remaining old forests, the harvest forecast should consider the need to reserve all of these stands, including those in the THLB, according to this submission.

The MoE submission expresses the opinion that modelling continuous aging in the non-contributing land base will not work.

### Non-Recoverable Losses

The GWS says the very low OAFs used in the base case do not adequately account for a reasonable projection of losses, especially given climate change. Fire control and salvage may limit disturbance losses to some extent, but they generally have limited effect on larger stochastic events.

### Mill Requirements

P&T says although their mills have not been operating at full capacity, the opportunity to acquire more timber will increase the likelihood of continuous operation, especially with the demise of the Softwood Lumber Agreement. More reductions could be devastating for people who rely on the forest industry, says P&T.

Canpar Industries says its particleboard plant depends on residues from local sawmills and they are exploring a trade arrangement with P&T (trading logs for sawdust and shavings) which would require a secure, long-term timber supply for Canpar.

### Socio-Economic Impacts

The GWS says it is prudent to begin to reduce the harvest level now to allow for community adjustment, given that long-term community economic stability and sustainability, and minimization of adjustment costs are the cornerstones of the Crown's objectives.

A petition signed by 27 people and four other submissions say the socio-economic analysis is flawed and overlooks:

- the significant subsidization of the forest industry.
- the forest industry's depletion of natural capital with severe long-term implications.
- the environmental degradation resulting from industry forestry, with unaccounted economic costs.
- that maintaining an inflated harvest allows industry overcapacity and inefficiencies to continue, and delays the transition to more diversification and value-added products.
- lost economic opportunities (tourism fishing, hunting, recreation, etc.).

The Village of Midway says that community is very heavily dependent on forestry for jobs and an industrial tax base.

P&T says polling done regarding the higher level plan showed that over 70 percent of people believe jobs and economic development are a priority. This indicates that economic growth is a significant issue for the majority of people, versus the vocal minority, according to this submission.

## Other Comments

Many submissions commented on factors or issues other than those specifically covered by Timber Supply Review documents. These comments are summarized in this section.

### Timber Supply Review Process

Fifteen submissions comment on the Timber Supply Review (TSR) process itself. These comments include the following:

- the TSR does not provide full accounting of the costs of the timber maximization policy, such as loss of biodiversity, species extinction, climate change, erosion, loss of economic opportunities and community insecurity. Similarly, there's no full cost accounting of the ecological services performed by forests.

- there is a visible bias to minimize the modelling of factors that may have a downward pressure on timber supply, which is evident by comparing assumptions used in other TSAs. Examples are provided.
- the GWS says various management issues raised in the rationale statement for the previous TSR have not been resolved, indicating the need for a more conservative harvest flow. Examples are provided. P&T says the Forest Service has done an excellent job in addressing issues raised in the last review.
- the ministry's refusal to participate in a public forum in November is protested.
- the ILMA says, after nine years of involvement in the TSR program, the Boundary *Analysis Report* is one of the better ones they have reviewed.
- the TSR does not allow for Code implementation, reduced area due to parks, Special Management Zones adjacent to parks, or for a Grizzly Bear Recovery Strategy.
- the analysis fails to address key issues and is in violation of Section 8(8) of the *Forest Act*. It is deficient in science, biased and prejudicial to the interests of B.C. and British Columbians. Details are provided.
- comments on the *Data Package* seem to have been ignored in the analysis.
- validity of the TSR is questioned, given the frequent use of words like estimated, forecasts, anticipated, etc.
- the TSR is driving future forest practices; what is actually current should be used in the base case with the assurance TSR will not drive operations.
- "abnormal devastations" should include clearcutting and intensive roadbuilding not just acts of nature.

### Management

Seventeen submissions comment on management practices or approaches. These comments include the following:

- the current rate of production can probably not be sustained because management practices allow for the consumption of natural capital through the conversion of natural forests to fibre farms.
- it is time the Forest Service adopted ecosystem-based forestry rather than volume-based management, given the growing consumer demand for eco-certified wood products.
- the district should look to restoration of damaged lands.
- by limiting our future forest base to economic monoculture, we devalue our resource and severely limit our options.
- selective and individual tree cutting is the way to go for long-term job gain and environmental protection.
- do not implement the higher level plan.
- restore the ecological integrity of special management zones.
- ban the export of raw logs.
- management that means tremendous waste on landings, more clearcuts, less clean water, less fish and fewer forest workers than ever before is abuse of our land and resources, and the people who depend on them.

### Harvest Levels

Most submissions express an opinion on the preferred harvest level. Thirty-six individual submissions and a petition signed by 27 persons support a reduced AAC. Forty submissions, including 14 form letters, support a drastically reduced AAC, as does a letter co-signed by 60 persons. The following reasons are given:

- to allow recovery of biodiversity and natural ecological processes.
- because of uncertainty about new and better information, and the recurrent theme of uncertainty in the data.
- to protect roadless areas for fish and wildlife needs, for their biological legacy, and for their contribution to combating global climate change.
- the large number of red- and blue-listed species indicates that harvesting and other human disturbance has reached an unsustainable level.
- to protect Granby Grizzly habitat, allow recovery of ecosystems and grizzly bears, and protect biodiversity.
- proposed rates of logging are in violation of international accords, such as the Convention on Biological Diversity, and will impede forest certification.
- maintaining or increasing the cut discourages diversification and promotes the status quo of low return and low employment for each tree cut.
- keeping it high imposes unacceptable costs on First Nations and exposes the Crown to potential liability for compensation for infringement on aboriginal rights.
- more clearcuts will affect quality of air and quantity of clean water.
- to allow tourism industry to develop.
- the market will be overloaded with beetle harvest for some time, keeping lumber and log prices very low.
- projections of future wood volumes are worrisome when existing plantations are in such poor condition.
- the level of subsidization of the industry.
- the value of high quality wood, produced in a sustainable manner, will steadily rise.
- it will be harder to reduce the AAC once it is increased, if that were required.

A petition signed by 27 persons, as well as several individual submissions, express dismay at the increase in the long-term harvest level (LTHL). They say the increase is based on anticipated gains in yields from plantations and maintain this is full of uncertainty. Should these gains occur, these submissions say, they should accrue to future generations.

Sixty-nine submissions express support for an increase in the AAC and the increased LTHL. These submission include 59 form letters and individual letters from the ILMA, the MP, the village of Midway and the cities of Grand Forks and Greenwood. The following reasons are given:

- to increase the economic stability of the area, providing stable jobs and tax base.
- to meet the timber supply objective of the higher level plan, given uncertainty in other parts of the Nelson region.

# Appendix 1

## Submissions received by the Boundary Forest District

### Submissions received on the Data Package

#### Forest industry

Pope & Talbot, Forestry Manager

#### Interest groups

Friends of the Granby Environmental Society
Granby Wilderness Society
Granby Wilderness Society & Friends of the Granby Environmental Society (joint)
Kettle Range Conservation Group

#### Local government

Forest Economic Development Officer, Boundary Economic Development Commission

#### General public

Four individual submissions

### Submissions received on the Timber Supply Analysis Report

#### Forest industry

Pope & Talbot (2 submissions)
Transwest Timber
Bell Pole
Interior Lumber Manufacturers Association
Canpar Industries
Boundary Woodlot Association
Federation of BC Woodlot Associations

#### Consultants

Marshall Forestry Services

#### Local government

Village of Midway
City of Grand Forks
City of Greenwood

### Member of Parliament

MP Kootenay-Boundary-Okanagan

### Government agencies

Ministry of Environment, Lands and Parks, Forest Ecosystem Specialist

### Interest groups

- Granby Wilderness Society (3 submissions, one of which is co-signed by 60 people)
  Boundary Naturalists
- North Okanagan Naturalists' Club

### General public

144 individual submissions (including 76 form letters)
one petition with 27 names